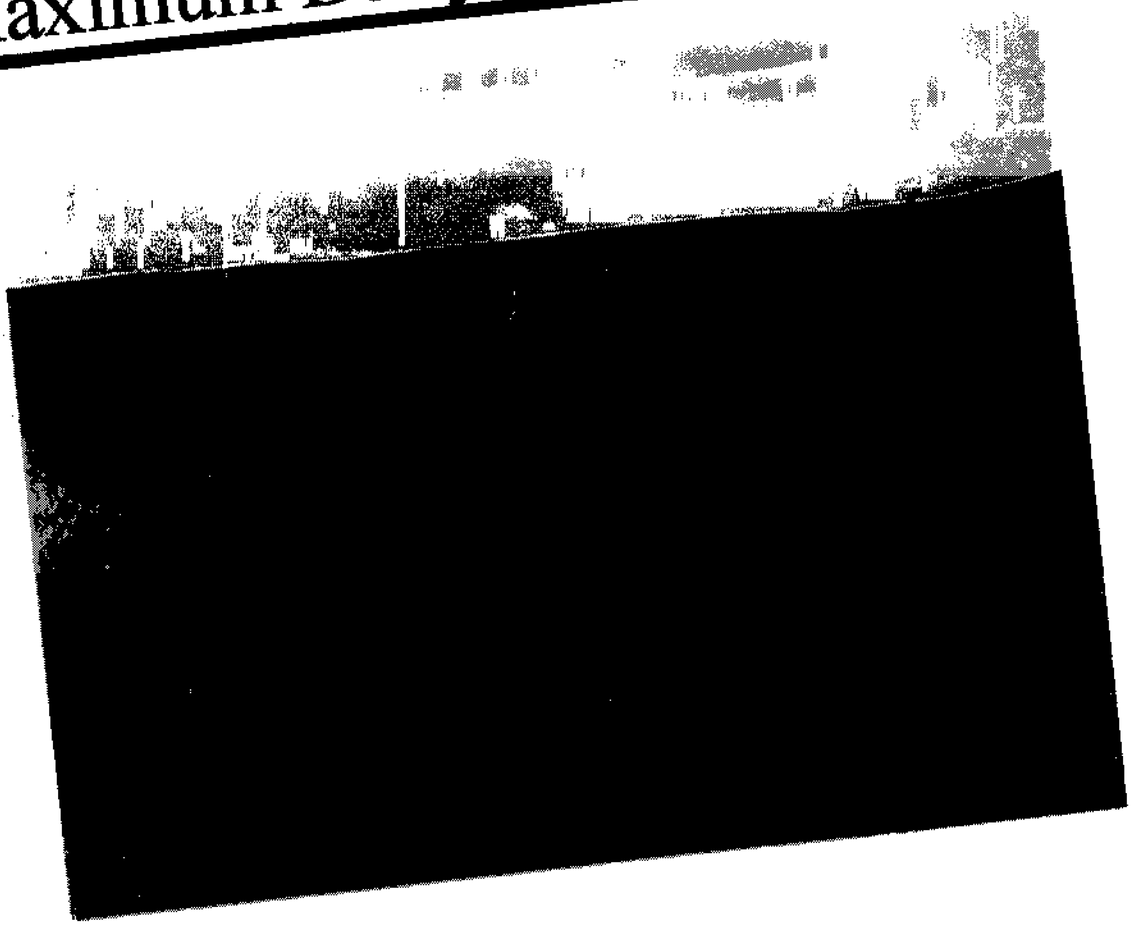
South Fork Owyhee River Subbasin Assessment and Total Maximum Daily Load



Prepared for the State of Idaho

by
Idaho Division of Environmental Quality
Boise Regional Office
1445 North Orchard
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December 1999

Hannaea

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September 9, 1999

Mr. Michael Ingham
State of Idaho
Division of Environmental Quality
Boise Regional Office
1445 North Orchard
Boise, Idaho 83716

Dear Michael:

Enclosed is my report on the five periphyton samples from the forks of the Owyhee River, and my bill for services.

All three sites are in pretty good shape. Both sites in Idaho fully support their aquatic life uses, according to the periphyton. There is some minor stress at the 45 Ranch site caused by inorganic nutrient enrichment, siltation, organic loading, and elevated temperature, but this stress does not seriously impair aquatic life uses.

In the East Fork, there are also signs of inorganic nutrient enrichment. However, the East Fork evidently has cooler waters in summer, less siltation, and less organic loading than either site on the South Fork.

Dominance by a single species of diatom indicated moderate impairment and partial support of aquatic life uses at the El Paso Pipeline site in Nevada. The primary cause of impairment here was enrichment by inorganic nutrients, probably phosphorus. Sedimentation was also a minor problem here in August.

I'll leave it to you to sort out how much of the observed stress is natural in origin and how much is due to agricultural activities.

Please write or call if you have any questions. Thanks for the work!

Sincerely,

Loren L. Bahls

Loren L. Bahls, Ph.D.
Phycologist

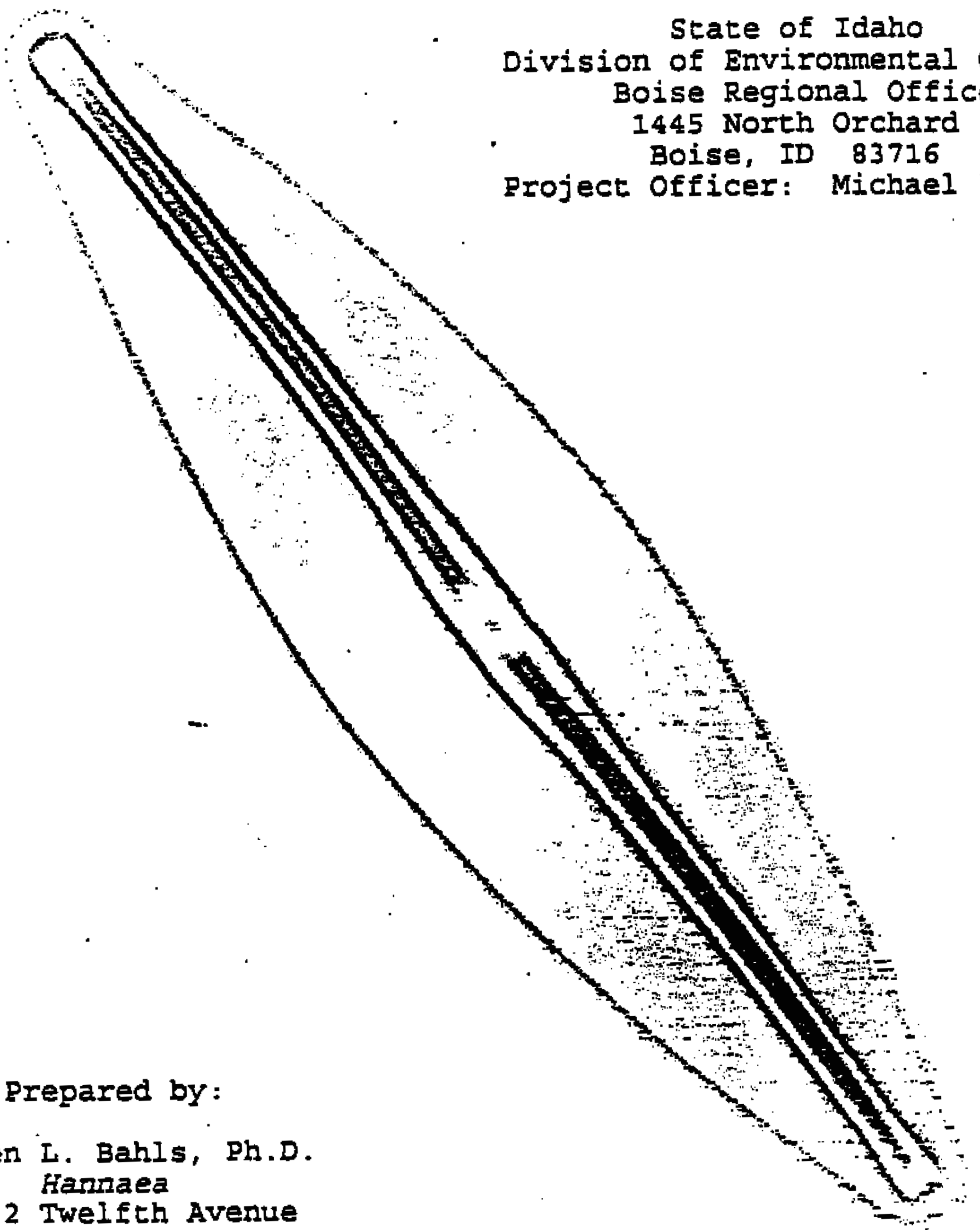
Enclosures: Owyhee River Report; Invoice

Frustulia bahlsii Edlund and Brant

SUPPORT OF AQUATIC LIFE USES IN THE SOUTH AND EAST FORKS OF THE OWYHEE RIVER BASED ON PERIPHYTON COMPOSITION AND COMMUNITY STRUCTURE

Prepared for:

State of Idaho
Division of Environmental Quality
Boise Regional Office
1445 North Orchard
Boise, ID 83716
Project Officer: Michael Ingham



Prepared by:

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September 1999

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1.0 Executive Summary

The South Fork Owyhee River is located in the far southwestern portion of the State of Idaho, and originates in the north central portion of the State of Nevada. The 4th Field Hydrologic Unit Code number is 17050105. Total land area is 1,183,923 acres (1850 mi.^{2}). Length of the overall river reach is 113 miles. Within Idaho, the reach is 32 miles from the Idaho-Nevada State line to the confluence with the East Fork Owyhee River. The total area within the State of Idaho is 154,810 acres (242 mi.^{2}). The area is predominately open desert and deep canyons.

In 1996, the South Fork Owyhee River was listed as water quality limited and placed on the 1996 303(d) list in accordance with the Clean Water Act. The designated beneficial uses are: cold water biota, salmonid spawning, primary contact recreation, secondary contact recreation, agricultural water supply, special resource waters and domestic water supply. Other protected uses include industrial water supply, wildlife habitat, and aesthetics. The listed pollutants that may be impairing the beneficial uses are temperature and sediments. As defined in 40 CFR Part 130, those segments listed as water quality limited are to have a total maximum daily load management plan developed to maintain or restore designated beneficial uses. A total maximum daily load management plan is to incorporate allocations for point sources (wasteload allocations) and non-point sources (load allocations). There are no known point sources that discharge to the South Fork Owyhee River in the State of Idaho.

Hydrology of the South Fork Owyhee River is the river itself. There are no perennial streams that feed the river within the State of Idaho. The only stream that may have any influence on load allocation would be the Little Owyhee River, which is intermittent. The South Fork Owyhee River is subject to "flashy" flow conditions with peak flows occurring anytime from January to June. Although, a majority of peak flows occur in May or June. There are no major impoundments in either Nevada or Idaho. The river originates in the Bull Run Mountains of north central Nevada. The parent geological material in the Bull Run Mountains is Paleozoic sedimentary material. Within Idaho, the parent geological material is either basalt or rhyolite.

Land use is mostly open desert grazing of livestock. Riparian areas are confined to canyon bottoms. Land ownership is mostly federal, with some private and State of Idaho school endowment lands. There are no permanent settlements in the watershed in Idaho, except for one small ranch, thirteen miles upstream from the East Fork Owyhee River. Early exploration of the area was mostly done by fur trappers, with livestock grazing beginning in the late 1800's.

Fish information is limited. A study in 1995 and again in 1999 did not indicate the presence of any salmonid species. It is expected that Redband trout may utilize the South Fork Owyhee River, possibly when water temperatures are cooler. It is not known if the river is utilized for spawning since most trout species use smaller tributaries for this activity. However, many species use larger rivers for rearing areas. Sculpin (a cool-cold water indicator) were found in 1995 and 1999. Other species found included Smallmouth bass, Suckers, and Pike minnow.

The flashy nature of flows in the South Fork Owyhee River appears to be the limiting factor for the presence of large woody vegetation. Young shoots or sprouts do not have an opportunity to develop and offer stream bank protection or shading. Groundwater storage is limited to the riparian areas and with the large fluctuation of surface waters, little bank storage is noted. The overall confinement of the river by the canyon walls dictates river morphology. Eroding river banks are common, but depositional areas are also common.

Macroinvertebrate sampling revealed that cold water indicators are present. Periphyton information would indicate that species present are a deviation from the expected condition. An independent study on periphyton data stated that aquatic life is supported with moderate impairment from temperature, sediment, organic loading and inorganic nutrients (Appendix C).

With the exception of temperature, water column chemistry meets the Idaho Water Quality Standards and Wastewater Treatment Requirements. Water temperatures often exceed water quality standards for the protection of both cold water biota and salmonid spawning. Warm water temperatures may be the most important factor limiting the presence of trout species.

There is no indication that sediments are impairing beneficial uses. Substrate for cold water species appears adequate. Pool complexity appears good with deep pools and adequate substrate to provide areas of refuge. Siltation is noted in slow moving areas, but riffles and pools appear adequate for support of cold water species. Limited turbidity information collected meets water quality standards. Certain macroinvertebrate species, Ephemeroptera-Plecoptera-Tricoptera, would indicate siltation is not impairing cold water biota. The presence of certain siltation intolerant, or non-motile, periphyton would also indicate sediments are not impairing the beneficial use.

Based on the lack of salmonid species, Redband trout, the river does not fully support the cold water biota designated use. Salmonid spawning is also not fully supported. For both designated beneficial uses, temperature is the limiting factor. It should be noted that it is not fully understood if Redband trout species, found in the Owyhee Desert's rivers and streams, would utilize the South Fork Owyhee River for spawning. An appropriate use may be rearing areas for young of the year, but once again little information is available on the habitat requirements for this trout species.

A total maximum daily load management plan for temperature is an appropriate vehicle for addressing temperature concerns in the South Fork Owyhee River. Load capacity are assigned within this document, which include load allocation as water enters the State of Idaho.

If the South Fork Owyhee River is able to meet Idaho temperature criteria at Idaho/Nevada border the argument could be made that additional increase in Idaho is natural, and develop site-specific criteria. A pending rule change will allow Idaho's natural background clause (IDAPA 16.01.02.070.06) to apply to temperature (IDAPA 16.01.02.070.06). This rule change is expected to be approved by the Idaho legislature in the Spring of 2000. Alternatively, if the South Fork Owyhee cannot meet Idaho temperature at the border, then it would seem that Idaho and Nevada need to work on jointly developing site-specific criteria.

1.1. Public Involvement

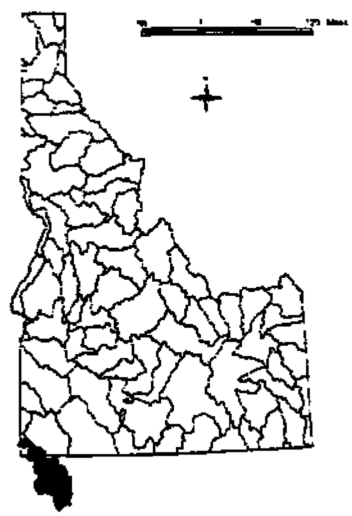
In accordance with IDAPA 16.01.02.052 (Public Participation), in the absence of a Watershed Advisory Group the local Basin Advisory Group shall be the lead entity for public participation. The Southwest Basin Advisory Group has been informed of the development of the South Fork Owyhee River Subbasin Assessment.

A public information meeting was held at the Pleasant Valley School on June 30, 1999, to inform the local stakeholders of the development of the Middle, North and South Fork Owyhee Rivers assessment plans. On November 3, 1999, a presentation was given to the Owyhee County Natural Resource Committee. Discussion on the total maximum daily load management plan for the North and Middle Fork Owyhee Rivers along with the Sub-basin Assessment for the South Fork Owyhee River occurred. On November 4, 1999, a public meeting was held at the Pleasant Valley School, Idaho, to discuss both documents.

1.2. Acknowledgment

We would like to acknowledge Liz Jenkins, Idaho Division of Environmental Quality-Boise Regional Office. Her expertise in technical writing and editing is greatly appreciated. Acknowledgment to the State of Idaho Bureau of Laboratories, Barry Pharoah along with his staff and Sandy Radwin, for completing laboratory analysis in a timely manner. Acknowledgment is extended to Dr. Loren Bahls for his interpretation of periphyton analysis and his ability to compile the analysis in such short notice.

South Fork Owyhee River



PRN's #:	632.00
HUC #:	17050105
SWB #:	231
WQLS#	2632
Pollutants of Concern:	Sediments Temperature
Beneficial Uses:	Primary Contact Recreation Secondary Contact Recreation Cold Water Biota Salmonid Spawning Special Recourse Waters Domestic Water Supply Agricultural Water Supply
Pollution Sources:	Non-point Sources

2.0 Watershed Characteristics

The South Fork Owyhee River originates in the Bull Run Mountains of north central Nevada and flows north from Elko County, Nevada to Owyhee County, Idaho (Figure 1). Figure 2, shows the general hydrology of the entire river. Total river length is 113 miles. The watershed consists of 1,183,923 acres (1850 mi^2). General characteristics of the land consist of mostly rangeland, irrigated agriculture, with some forested areas at higher elevations. The hydrologic unit code (HUC) number is 17050105.

The section of the South Fork Owyhee River within the State of Idaho encompasses 154, 810 acres (242 mi^2). The segment is further broken into four 5th Field HUCs (Figure 3). No other streams in this HUC is listed as water quality limited. Table 1, shows the individual 5th Field HUCs and the breakdown of watershed size and the percentage of the entire watershed within Idaho. The segment in Idaho begins at River Mile 0 and continues to River Mile 32.1 (Nevada-Idaho State Line).

The South Fork Owyhee River was listed as "water quality limited" based on best professional judgement, and limited water quality data and information. The listed pollutants are sediments and temperature. The South Fork Owyhee River's designated beneficial uses are listed in Table 6 (Section 2.3).

As described in IDAPA 16.01.02.053, a determination of beneficial use support status can be made if all applicable water quality standards are being achieved including criteria developed pursuant to the rules, and whether a healthy, balanced biological community is present. The South Fork Owyhee River was placed on the federal Clean Water Act §303(d) list in 1996. This was in response to litigation in federal district court concerning the list and a review by the EPA of the 1988 §305(b) report. The report used best professional judgement in determining that cold water biota and salmonid spawning may not be fully supported.

Table 1. Idaho 5th Field Identification, Name, 5th Field Acres and Percent; and the Little Owyhee River Segment in Idaho. South Fork Owyhee River.

5th Field HUC ID #	Name	Acres	% of Total
170510501	SF Owyhee	44,692	28.9
170510523	Spring Creek	22,700	14.7
170510502	Middle South Fork	42,082	27.2
170510503	Homer Wells Reservoir	45,139	29.2
	Total	154,613	100
1705106	Little Owyhee River	57,985	

[1]Total Land Area May Differ From Ownership, and Land use Since a Portion of HUC is in Oregon

Figure 1. South Fork Owyhee River and Little Owyhee River; HUCs 17050105 % 17050106.

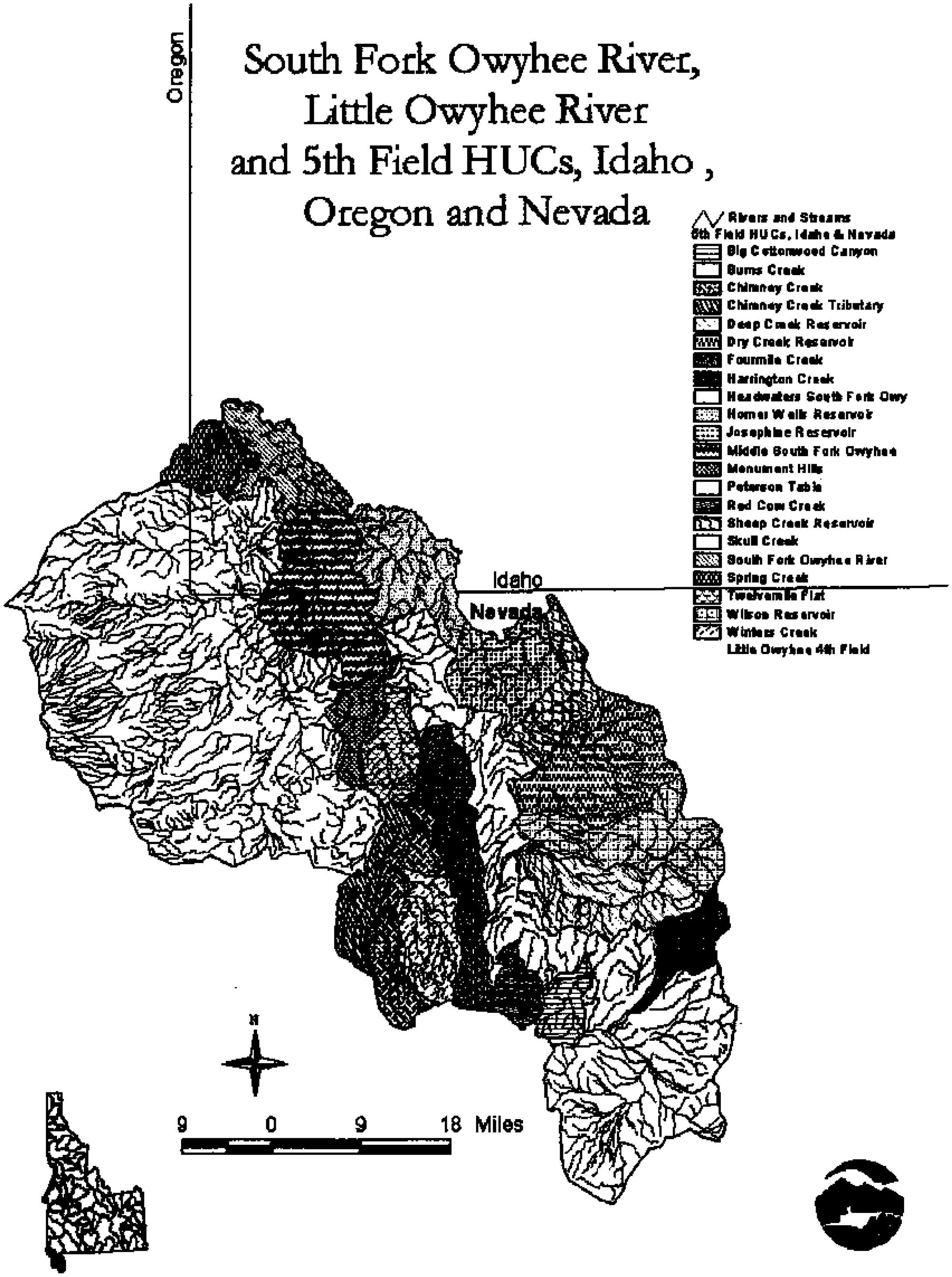


Figure 2. 5th Field HUCs. Including Little Owyhee River 4th Field; Idaho, Oregon and Nevada. South Fork Owyhee River.

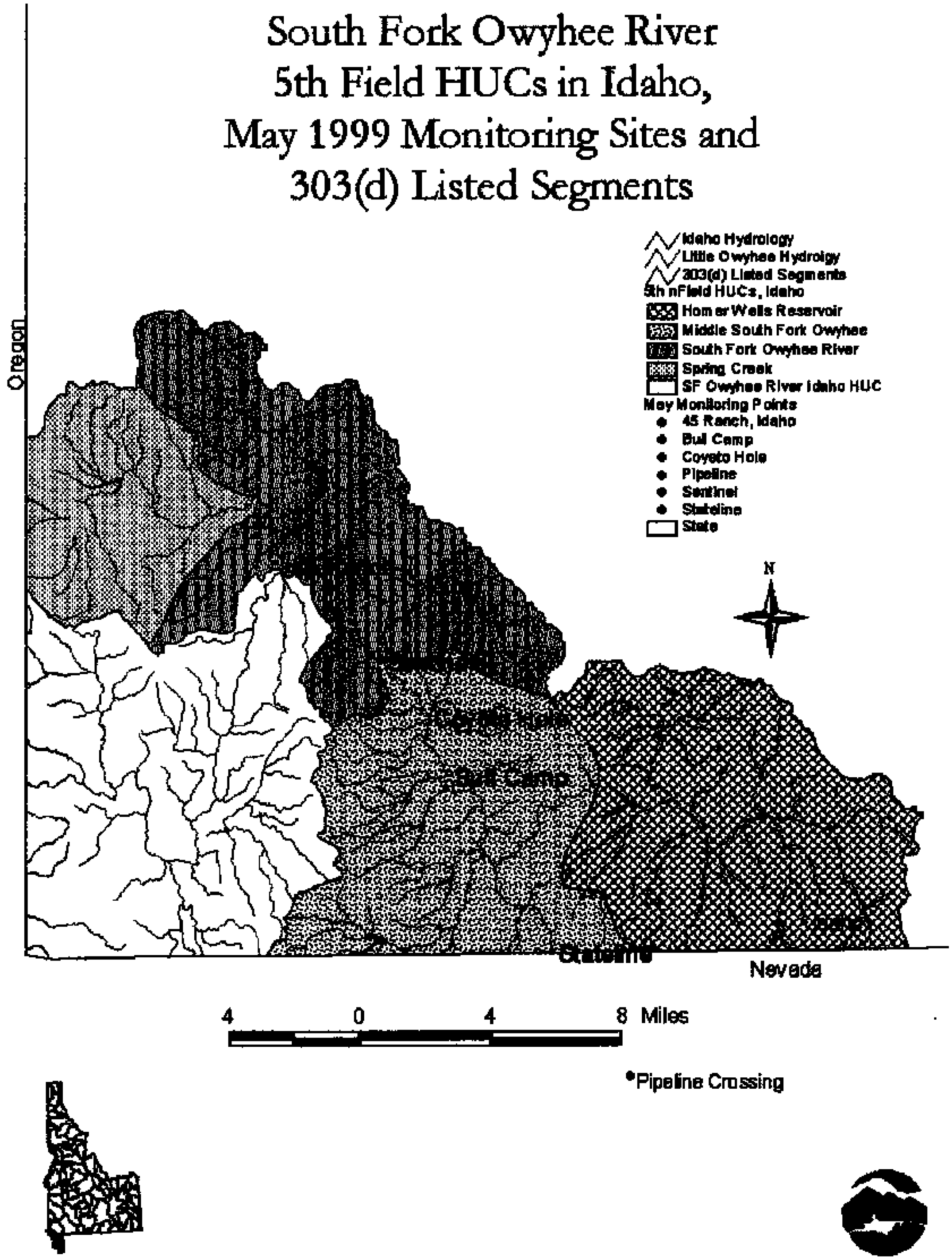


Figure 3. 5th Field HUCs in Idaho, May 1999 Monitoring Sites and 303(d) Listed Segments. South Fork Owyhee River.

2.0.1. River Hydrology/Morphology

Stream gradient through the canyon segment, YP Ranch to the confluence of East Fork, segment averages about 0.24%. Total length is 55.8 miles from the YP Ranch, Nevada to the confluence with the East Fork Owyhee River (canyon segment). Elevation drops 218 meters (700 feet) through the canyon segment. Overall length is approximately 113 miles, with an approximate elevation drop of 2133 meters (7,000 feet) from the Bull Run Mountains to the confluence with the East Fork Owyhee River.

The South Fork Owyhee River is classified as a 6th Order Stream, based mainly on drainage area. Channel characteristics within Idaho is a box canyon type, with a confined river channel and little access to a flood plain. Stream type would be characteristic of a F Channel Type due to entrenchment (Rosgen, 1996). It is not clear whether the river should be classified as F3, F4 or F5 channel type. Mosely (1999) described the system as a F5 due to the observation of sandy substrate. Other observations of gravel-cobble-boulder substrate would place the system in a F3-F4 channel type.

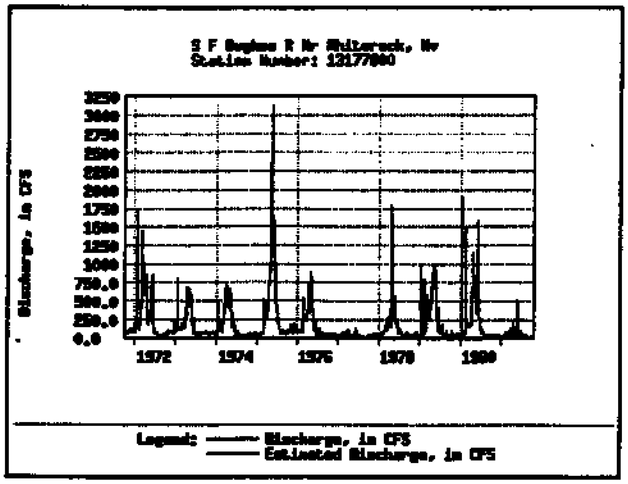
In the agricultural areas in northern Nevada, channelization of the South Fork Owyhee River and other tributaries has occurred. Mosely (1999) calculated approximately 65 miles of channelized systems in Nevada. Mosely (1999) felt these channel alteration/modifications may impact water quality by preventing waters that originate in the Bull Run Mountains from access to the historic flood plains in the basin. This would increase the amount of sediments transported downstream that would have been trapped in the historic floodplain.

The main hydrologic characteristic of the South Fork Owyhee River subbasin in Idaho is the river itself. There are no perennial streams entering the river throughout the segment in Idaho. The Little Owyhee River (River Mile 13) is intermittent and may only discharge to the South Fork during storm events or during low elevation snowmelt events in the winter or spring. There are no permanent gaging stations on the Little Owyhee River. The Little Owyhee River does not appear to have any notable winter snow accumulation areas (Moseley, 1999). The alluvial outwash, and river terrace, which is now the 45 Ranch, would indicate that the Little Owyhee River is a sediment source to the South Fork.

For the South Fork Owyhee River, flow is governed by snow accumulation, and melt, in the north central Nevada mountains (Bull Run Mountains), and to some extent, irrigation water releases from agricultural areas in northern Nevada. There are no large impoundments on the river. However, several small reservoirs can be found in the northern Nevada agricultural areas. The largest, Sheep Creek and Wilson Reservoirs, are about 700 acres, while most of the other reservoirs are smaller between 20 to 100 acres in size. Further assessment of landuse in Nevada is not within the scope of this document.

Peak flows, or discharges, can occur anytime from January to June, with a majority of peak flows occurring in May or June (USGS Internet Retrieval, Station 13177800). Early or late winter peak flows are probably associated with rain on snow events. Figure 4, shows flows from 1972 through 1981 (gage was discontinued in 1981). Figure 5, shows a typical flow during 1979.

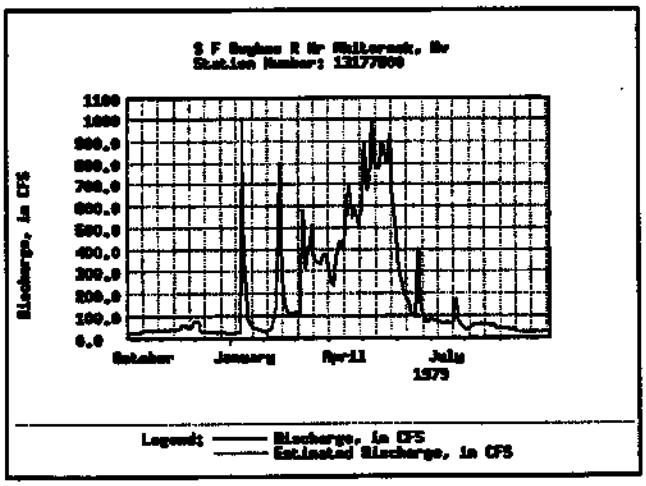
Historical Streamflow Daily Values Graph for S F Owyhee R Nr Whiterock, Nv (13177800)



Some stations have red data points. These represent days for which data were estimated, rather than recorded.

Figure 4. Discharge/Flows South Fork Owyhee River 1971 through 1981. South Fork Owyhee River.

Historical Streamflow Daily Values Graph for S F Owyhee R Nr Whiterock, Nv (13177800)



Some stations have red data points. These represent days for which data were estimated, rather than recorded.

Figure 5. Flow/Discharge Data, South Fork Owyhee River, Water Year 1979. South Fork Owyhee River.

From River Mile 56, YP Ranch, there is little evidence of alteration of river flow or stream bank modification. Although, at River Mile 13, the 45 Ranch has constructed a small diversion structure for their water delivery system.

In some areas within the canyon, the canyon bottom can open up to 300-500 meters (canyon base to canyon base), with river terraces from the toe of the canyon, to the riverbank. Within the deep canyons, the canyon bottom can be 50-100 meters in width. Canyon width appears to be based on parent geological material, with steeper and more confined canyon areas in the Rhyolite material (USGS 7.5 minutes quad maps; State Line Camp, Twelve Mile Flat SE, Rubber Hill, Bull Camp Butte, Coyote Hole, Grassey Ridge, and Spring Creek Basin). Canyon depth averages about 100-300 meters. Canyon width can vary from 1/4 mile up to two miles, and sometimes demonstrates a canyon within a canyon characteristic in many areas.

2.0.2. Climate

The only climate monitoring station within the watershed is located at Tuscarora, Nevada. The elevation for this station is 6180 feet (Internet Retrieval, Western Regional Climate Center, Station 268346, 1999). This station may not reflect actual temperature data at lower elevations. Other weather stations in the immediate areas are located on Table 2 and shows station elevation, average maximum daily temperature for June through September, average minimum daily temperature for June through September, average yearly precipitation, and average yearly snow accumulation.. There are three stations outside the watershed that may actually reflect expected weather conditions in the South Fork Owyhee River watershed. These are McDermitt, Nevada (Elevation 4450 feet); Danner, Oregon (Elevation 4230 Feet); and Paradise Valley Ranches, Nevada (Elevation 4680 Feet) (Western Regional Climate Center, 1999. Internet Retrieval). Elevation at the discontinued USGS Gaging station at Whiterock is 4900 feet, at the El Paso Pipeline crossing the elevation is 4600 feet. The 45 Ranch elevation is 4300 feet, the confluence with the East Fork Owyhee River, the elevation is approximately 4200 feet.

The canyon segment of the South Fork Owyhee River likely receives between 9 and 11 inches of precipitation annually. There is probably not a permanent winter snow accumulation within the canyon. Temperatures average 80-85°F during summer months, but in all likelihood exceed 100°F on occasion during June, July, and August. Overnight temperatures in the canyon are affected by several factors. "Cold pooling" may result in pockets of cool air. Drainage winds may also cause mixing and create warmer air. Sheltered areas may also have areas which maintain higher temperatures from daily heating.

Table 2. Climatic Summary, Available Weather Information Near the South Fork Owyhee River. South Fork Owyhee River.

Station and Station Identification	Paradise Valley, Nevada[1] (266005)	Three Creeks, Idaho[2] (109119)	Danner, Oregon[3] (352135)	Owyhee, Nevada[4] (265869)	McDermitt, Nevada[5] (264935)
Elevation (feet)	4680	5400	4230	5400	4450
Max Average Temp, June-thru September (in °C)	84.7	80.1	83.5	78.9	83.4
Min Average Temp, June thru September (in °C)	43.7	38.1	43.0	46.4	43.2
Average Precip. (inches)	10.1	12.9	11.6	14.6	9.6
Average Snow accumulation (inches)	28.9	73.1	25.2	69.1	9.0

[1]Period of Record 1948 through 1998, [2]Period of Record 1940 through 1987, [3]Period of Record 1930 through 1998, [4]Period of Record 1948 through 1985, [5]Period of Record 1950 through 1998.

2.0.3. Geology and Soils

The South Fork Owyhee River drainage is located within the Columbia River Intermountain Physiographic Province. The Owyhee Plateau, which is part of that province, is a broad volcanic plain extending south from the Silver City range into Nevada and west into eastern Oregon. The geology of the Owyhee Plateau is composed of thick layers of rhyolitic lavas and ash-flow tuffs dating from the Miocene age (9.6 to 13.8 million years ago). These sheets of rhyolitic lava and welded tuffs originate from two or more eruptive centers at Juniper Mountain. Overlying the rhyolites is a relatively thin veneer of sediments and basalt flows erupted from numerous shield volcanoes throughout the area, called the Banbury basalt, this formation is about 8 to 10 million years old.

The South Fork Owyhee River drainage is located within the High Rhyolite and Basalt Plateau soil physiographic region. These soils have an acidic/xeric or xeric soil moisture regime (i.e., very little moisture) and a mesic or frigid soil temperature regime. They range from shallow to deep and well drained. Textures range from silt loams to clay loams with a varying amount of rock fragments both on the soil surface and in the profile. Figure 6, shows the general geological formation within the South Fork Owyhee River within Idaho.

2.0.4. Fisheries

Little information is available for fisheries in the subbasin. Redband trout are a known cold water species that inhabits the arid Owyhee Desert's streams and rivers (Redband trout are a sub-species of Rainbow trout found in the Owyhee Desert). The remoteness of the South Fork Owyhee River and the inaccessibility of deep canyon areas makes an overall survey impossible. Data for actual angler use is nonexistent.

Allen et al. (1996) initiated a survey on the South Fork in September 1995. Three sites were electro-fished and no trout were captured. Table 11, shows the location of the 1995 effort. In 1999, DEQ attempted electro-fishing at the 45 Ranch and once again no trout were captured. Table 10, shows the results of the 1999 effort. Suckers (*Catostomida spp.*) were the dominant species found in 1999. However, sculpin (*Cottus baird*) were found in riffle areas. Sculpin are usually an indicator of clean gravels and good water quality (Simpson and Wallace, 1982). In June and July, 1999, Redband trout were believed to have been seen in an area where cooler water from the 45 Ranch's water delivery system was seeping back to the river (Personal observation, Ingham, 1999).

Information from 1995 (Allen et al., 1996) and from 1999, would indicate that Redband trout are not present during the warmer summer months. However, Allen (1996) found what would be considered a low density of Redband trout in the East Fork Owyhee River. The use of both rivers for spawning activity of salmonid species is not known. Redband trout may not utilize large river systems for spawning, but could use them for rearing areas. However, little is known about habitat needs for Redband trout and their spawning requirements.

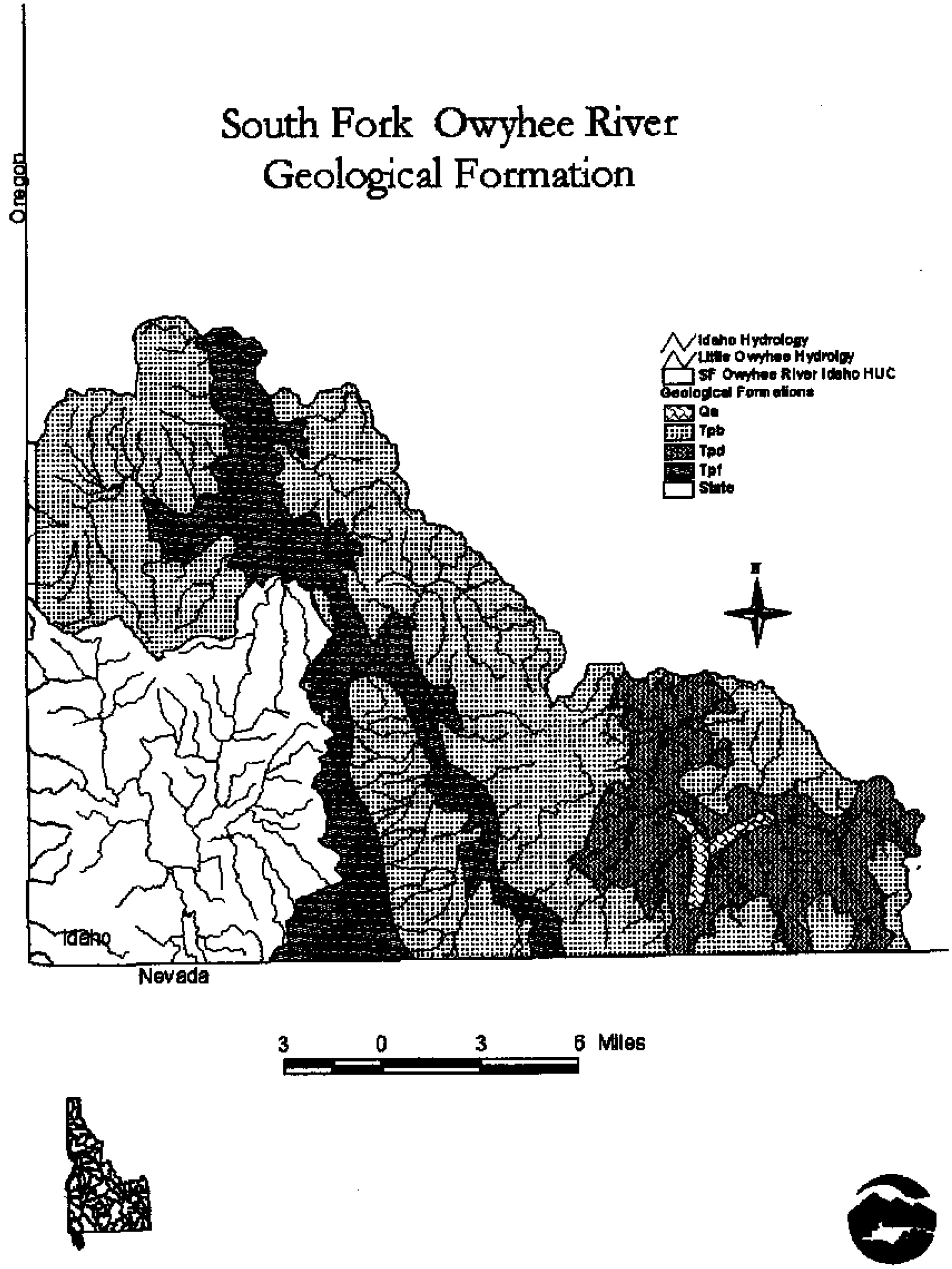


Figure 6 . Geological Formations. South Fork Owyhee River

2.0.5. Current Land Use

Land use is dominated by grazing. All lands within the Idaho section of the South Fork Owyhee River are managed for grazing. Four allotments make up this area. Table 3 shows the allotment identification numbers, allotment names, acres, and animal units months (AUMs). A calculated total of 18,619 AUMs are associated with the South Fork area. However, some of the AUMs are within the Little Owyhee River watershed.

Table 3. Allotments Within the South Fork Owyhee River Drainage, Idaho (BLM, 1999). South Fork Owyhee River Drainage. South Fork Owyhee River.

Allotment #	Allotment Name	Acres[1]	AUMs
0629	45	65,434	2,012
0584	Garat	211,809	15,199
0661	Trent Creek	61,819	1,328
0524	Garat Individual	1,122	80

[1] Contains acreage in Private, State and Federal Ownership.

Recreation opportunities are limited by the remoteness of the South Fork. However, rafting of the river is an increasing use during high discharge periods (May and June). The river, canyons and uplands support a wide variety of big game, upland birds, waterfowl, and raptors. The area receives hunting pressure for Pronghorn Antelope, Big Horn Sheep, and Mule Deer. Chukkers and Grouse are also hunted throughout the uplands.

Riparian areas make up a small percentage (8.5%) of overall land use and are mainly confined to the narrow river corridor within the canyon and the limited number of springs and seeps. The remainder of the land use is open range grazing in the uplands. Table 4, shows the breakdown of land use classifications and a percentage of the total. Figure 7, shows current land use.

Table 4. Land use for the South Fork Owyhee River and Little Owyhee River. Acres and Percent. South Fork Owyhee River.

Land use	Acres [1]	Percent
Riparian	13,217	8.5
Open/Rangeland	141,369	91.5
Little Owyhee River		
Riparian	8,482	15
Open/Rangeland	48,985	85

[1]Total Land Area May Differ From Ownership, and Land use Since a Portion of HUC is in Oregon

2.0.6. Land Ownership

Land ownership is mostly Federal and is managed by the BLM. Private lands are found at the 45 Ranch and at Coyote Springs, all within the river corridor. Table 5, shows a breakdown of land ownership, number of acres, and percent. Figure 8, shows that ownership.

Table 5. Ownership Identification, Acres Managed & Percent; South Fork Owyhee River and Little Owyhee River. South Fork Owyhee River.

Owner	Acres [1]	Percent
Private	397	<0.3
State of Idaho	5756	3.5
Bureau of Land Management	154,810	96.2
Total	160,963	
Little Owyhee River		
Private	254	<0.1
State of Idaho	2558	4.0
Bureau of Land Management	54,655	95.0
Total	57,467	100

[1]Total Land Area May Differ From Ownership, and Land use Since a Portion of HUC is in Oregon

2.0.7. Historic Presence of Man

Owyhee County was first inhabited by the Bannock tribe. In 1819 and 1820 the area was explored by Hawaiian fur trappers, this is how the county received its name. Owyhee is another spelling for Hawaii. The county was established December 31, 1863. The county seat moved twice before finding its current home at Murphy in 1934. Gold and silver mining produced millions of dollars in revenue from 1863 up through the early 1900's.

2.0.8. Social and Economic Base

Agriculture provides the greatest percentage of the economic base and is the largest employer in Owyhee County. In 1996, 1,054 jobs were directly related to agriculture (Idaho Department of Commerce, Internet Retrieval, 1999). Approximately 110,000 cattle can be found in Owyhee County (United States Department of Agricultural (USDA), Internet-Retrieval, 1999). Average income, or value of product sold from farm/ranch operation is approximately $180,656.00 for 1990 (Idaho Department of Commerce, Internet Retrieval, 1999). The exact breakdown of the economics for the South Fork Owyhee River watershed cannot be determined with the current available information.

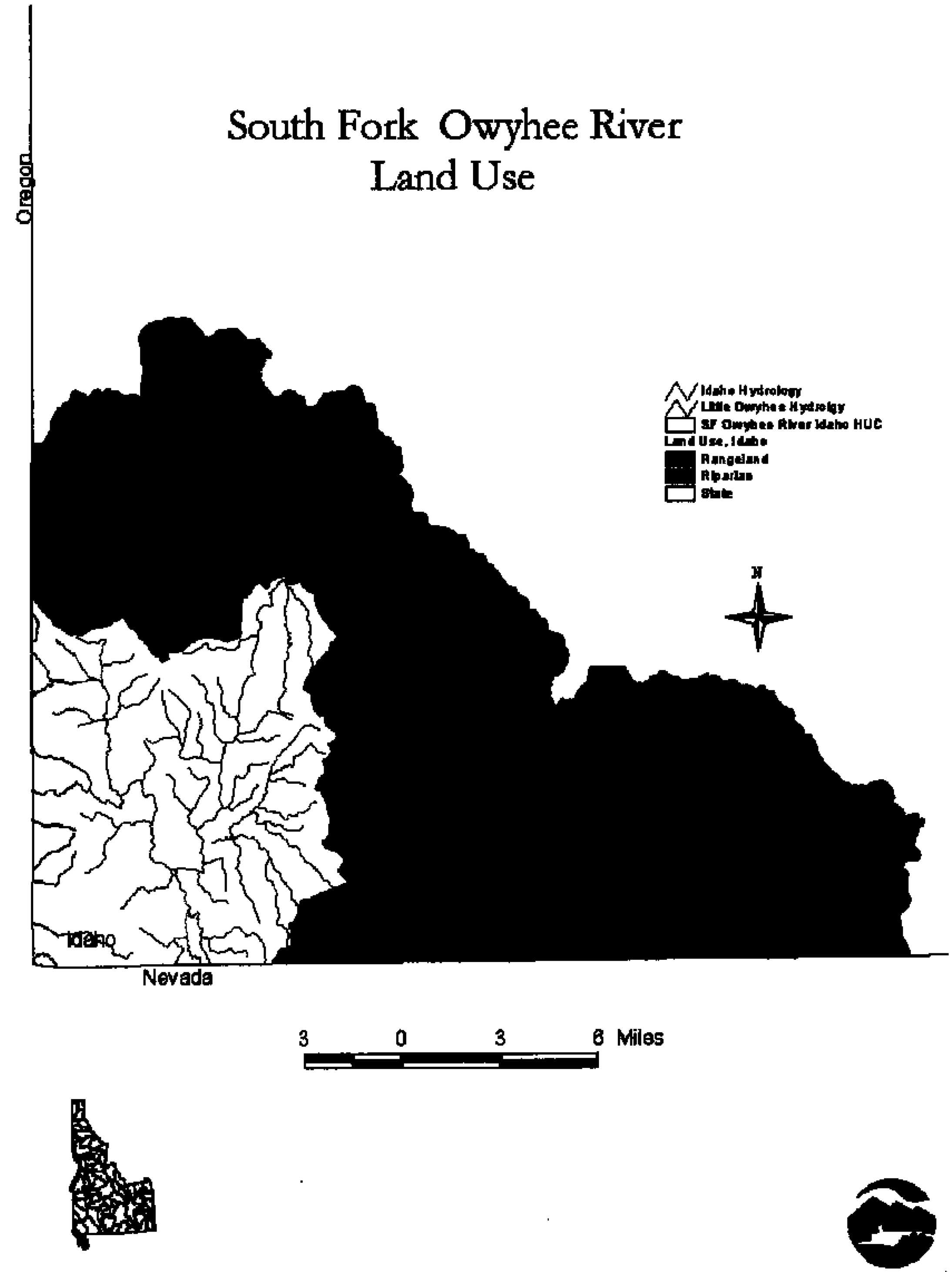


Figure 7. Land Use. South Fork Owyhee River

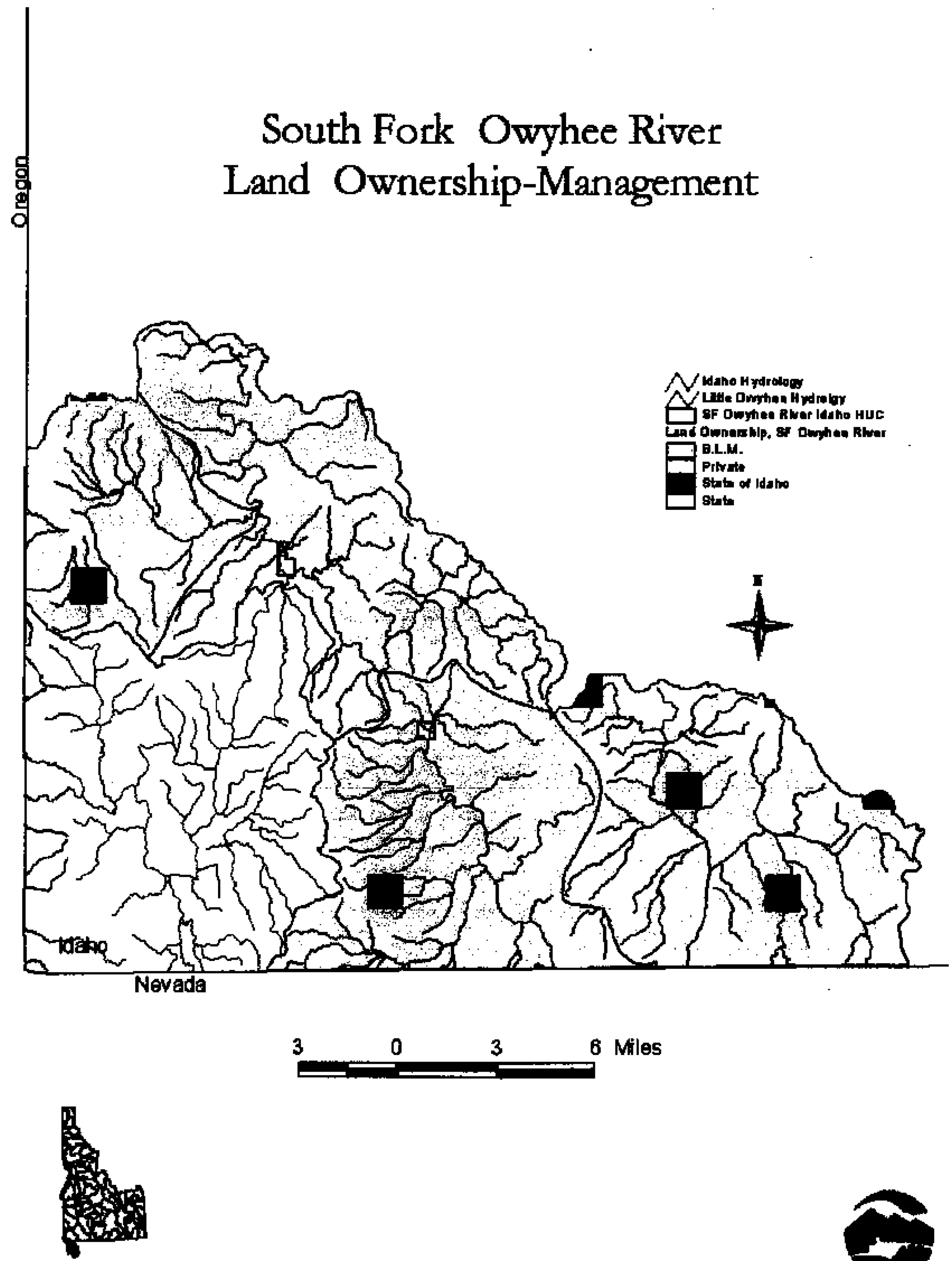


Figure 8.. Land Ownership-Management. South Fork Owyhee River

2.1. Beneficial Use Designation History

In 1972, the Federal Water Pollution Control Act (Act) (PL-92-500) or Clean Water Act (CWA), was passed by the United States Congress. This law gave the United States Environmental Protection Agency (USEPA) authority to oversee state water quality programs.

Under 40 Code of Federal Regulations §131.10(a), each State has to specify appropriate water uses to be achieved and protected. In 1975, the State of Idaho complied with the CWA and designated protected beneficial uses on certain water body segments within the state (IDAPA 16.01.02.110 through 16.01.02.160). The South Fork Owyhee River is one of these segments (IDAPA 16.01.02.140.01.j). At the time of designation, public input, available data and best professional judgement were utilized to determine uses (see Table 6). Other streams and rivers without specific designated beneficial uses are protected under other portions of the water quality standards (IDAPA 16.01.02.200, 01 through 08 and IDAPA 16.01.02.100, 01 through 05).

A water quality standard defines the water quality goals of a particular water body by designating use or uses to be made of the water body and establishment of numeric and narrative criteria (ambient conditions) necessary to protect the existing uses. Existing use means those surface water uses actually attained on or after November 28, 1975, whether or not they are designated uses.

All waters are protected through general surface water quality criteria. A narrative criteria prohibits ambient concentrations of certain pollutants which may impair beneficial uses. For the State of Idaho these criteria include: hazardous materials, toxic substances, deleterious materials, radioactive materials, floating, suspended or submerged matter, excess nutrients, oxygen demanding materials and sediments (IDAPA 16.01.01.200).

2.1.1. Current Beneficial Use Status

The designated beneficial uses for industrial water supply, agricultural water supply, wildlife habitat, aesthetics, and primary and secondary contact recreation appear to be fully supported for the South Fork Owyhee River.

Cold water biota is classified as existing, but not full support. Water temperatures are warm and often exceed 26° C. The presence of cold water periphyton and macroinvertebrates would indicate existing use. However, the lack of cold water fish would indicate not full support of this use.

Salmonid spawning does not appear to exist, and is classified as not full support. The lack of salmonid species and any reproductive indicators would indicate this use is not full support.

Table 6. Designated Beneficial Uses, Status and Pollutant(s) of Concern. South Fork Owyhee River.

Beneficial Use	Support Status 1975	Support Status	Pollutant(s) of
Agriculture Water	Full Support	Full Support	NA [1]
Domestic Water	Full Support	Full Support	NA [1]
Industrial Water	Full Support	Full Support	NA [1]
Wildlife Habitat	Full Support	Full Support	NA [1]
Aesthetics	Full Support	Full Support	NA [1]
Special Resource	Full Support	Full Support	NA [1]
Cold Water Biota	Support Status	Existing	Temperature
Salmonid Spawning	Support Status	Not Full Support	Temperature
Primary Contact	NA [2]	Full Support	NA [1]
Secondary Contact	NA [2]	Full Support	NA [1]

N\A 1) Not Applicable
N\A 2) Available Information not Adequate

2.2. Designated Beneficial Uses Rationale/Justification

2.2.1. Agricultural Water Supply

The South Fork Owyhee River, along with most waters of the state, is protected for agricultural water supply (IDAPA 16.01.02140,01.j. and IDAPA 16.01.02100.01.a.). In the water quality standards this is defined as follows: "Agricultural: waters which are suitable for the irrigation of crops or as drinking water for livestock."

Agricultural water supply can be impaired by nutrients, bacteria (along with viruses and protozoans), algae, sediments, flow modification, and other conditions that may affect the quality and quantity of water. There are no numeric state standards to determine support status. Historical and current water quality information has demonstrated that agricultural water supply is fully supported in the South Fork Owyhee River.

2.2.2. Domestic Water Supply

Domestic water supply is a designated beneficial use for the South Fork Owyhee River (IDAPA 16.01.02.100.01.b. and IDAPA 16.01.02.140.01.j). The standards state "Domestic Water Supplies: water which are suitable or intended to be made suitable for drinking water supply...". Although the South Fork Owyhee River is designated for domestic water supply, there are no public water systems collecting surface water for domestic use.

2.2.3. Industrial Water Supply

Industrial water supply is a protected beneficial use for the South Fork Owyhee River (IDAPA 16.01.02.100.01.c.). Historical and present water quality information concludes that industrial water supply is supported.

2.2.4. Wildlife Habitat

All waters of the State, including the South Fork Owyhee River, are protected for wildlife habitat (IDAPA 16.01.02.100.04.). Historical and present water quality information demonstrates that wildlife habitat is supported in the South Fork Owyhee River.

2.2.5. Aesthetics

All waters of the State, including the South Fork Owyhee River, are protected for aesthetics (IDAPA 16.01.02.100.05.). There is no criteria with which to judge the aesthetics of a river. The State of Idaho DEQ has not received complaints concerning the aesthetic quality of the South Fork Owyhee River.

2.2.6. Cold Water Biota

Cold water biota is a designated beneficial use for the South Fork Owyhee River (IDAPA 16.01.02.140.01.j and 16.01.02.100.02.a.). There are numeric and narrative criteria within the state water quality standards to protect cold water biota. Numeric standards for pH, total concentration of dissolved gases, toxic substance criteria and chlorine can be found in IDAPA 16.01.02.250.02. Standards that are specific to cold water biota: dissolved oxygen concentrations; un-ionized ammonia; turbidity; and temperature can be located in IDAPA 16.01.02.250.02.c.

Present and historical water quality information demonstrates that cold water biota is existing, but not fully supported. Temperature data demonstrates an exceedance of the temperature standards during the months of June, July, August, and September. The lack of trout species, and reproduction indicators (diverse age classes), would indicate non-support.

2.2.7. Salmonid Spawning

Salmonid spawning is a designated beneficial use for the South Fork Owyhee River (IDAPA 16.02.140.01.j. and 16.01.02.100.02.c.). Numeric standards for pH, total concentration of dissolved gases, toxic substance criteria and chlorine are set in the state water quality standards (IDAPA 16.01.02.250.02). Standards that are specific to salmonid spawning: dissolved oxygen concentrations, un-ionized ammonia, intergravel dissolved oxygen, and temperature can be located in IDAPA 16.01.02.250.02.c. The IDAPA 16.01.02.250.02.d.iv., lists time periods when salmonid spawning occurs and the period when salmonid spawning criteria should be applied. Table 7, shows the probable salmonid species of concern for the South Fork Owyhee River, and the time period that applicable water quality criteria should be applied.

There is limited information on Redband trout. They appear to have the capability to adapt to adverse conditions, such as low or intermittent flows, and water temperatures greater than 28°C (Zoellick, 1999). However, it is not fully understood whether this trout species would utilize the South Fork Owyhee River for spawning.

Table 7. Probable salmonid species present in the South Fork Owyhee River. Common name, scientific name and protected spawning periods. South Fork Owyhee River.

Common Name	Scientific Name	Annual Period for Protection
Redband Trout	*Oncorhynchus mykiss gairdeneri*	March 1 through July 15

Historical and present water quality and fish information demonstrates that salmonid spawning is not supported. Temperature data shows an exceedance of the temperature standards during June and July. Also, the lack of any age classes of trout would demonstrate this use is not supported.

2.2.8. Recreational Use

Both primary contact recreation and secondary contact recreation are designated beneficial uses for the South Fork Owyhee River (IDAPA 16.01.02.140.01.j and 16.01.02.100.03.a & b.). Primary contact recreation waters are to be protected for public health in those cases where the ingestion of small quantities of water is probable. Such activities are swimming, water skiing, scuba diving, etc. Secondary contact recreation protected waters are those waters where use is on or about the water. Those activities may include wading, fishing, boating or other activity where ingestion of water is not probable.

Present water quality information demonstrates that primary and secondary contact recreation are fully supported for the months from June through September. Bacteria information obtained for May, June, July, August and September, 1999, did not show that state standards were exceeded for either beneficial use. for the months from June through September. Table 8. Shows the results of Fecal coliform monitoring conducted in 1999.

Table 8. Fecal Coliform Results, South Fork Owyhee River, 1999. South Fork Owyhee River.

Date/Station	May 11, 1999 count/100ml	June 14, 1999 count/100ml	July 13, 1999 count/100ml	August 16&17, 1999 count/100ml	September 22, 1999 count/100ml
El Paso Pipeline	20 [1]	22 [2]	16	<2	12
45 Ranch	50	10 [2]	2	<2	<2

[1] Sample actually collected at YP Ranch
[2] Sample is actually E. Coli.

2.2.9. Special Resource Water

South Fork Owyhee River is designated as a special resource water (IDAPA 16.01.02.140.01.j.). Special resource water is defined in IDAPA 16.01.02.056. To qualify as a Special Resource Water, only one of the criteria needs to be achieved (IDAPA 16.01.02.056. a-f.). For the South Fork Owyhee River, the designation is justified, and would be classified as full support of this designation. (Personal Observation, Ingham, 1999).

2.3. Water Quality/Biological Information

In 1999, Division of Environmental Quality-Boise Regional Office under took the responsibility to examine the South Fork Owyhee River and develop a subbasin assessment, and TMDL if appropriate. With limited resources and time, it was determined that the implementation of the Idaho Rivers Ecological Assessment Framework (Grafe et al., 1999 **DRAFT**) may be an appropriate assessment tool. This assessment tool allowed for a variety of parameters to be examined to determine compliance with State of Idaho water quality standards and beneficial use support (IDAPA 16.01.02.053.). The Idaho Rivers Ecological Assessment Framework, or Large Rivers Protocol, looks at biological and chemical information to determine support status and to examine water quality information that may impair the beneficial uses.

The Large River Protocols require that information from at least two of the four assessments components be available to make a support status call. For the South Fork Owyhee River, three of the components are utilized. Fish information will be based on presence/absence information only. Water chemistry, or physicochemical information was collected in May, June, July, August and September. Parameters included: Fecal Coliform Bacteria; Biological Oxygen Demand (BOD); Total Phosphorus; Ammonia+Nitrate; Total Solids (Total Residue); Temperature; Dissolved Oxygen; and pH. Macroinvertebrates were collected in July and again in August. Periphyton were also collected during July and August. Electro-fishing was conducted in late September, but will not be run through any index. Water temperature was obtained by the use of Onset™ Stowaway™ or Hobo™ continuous temperature recorders. Continuous temperature recorders were placed in two locations, Nevada and Idaho, with continuous temperature data available from mid June until late September.

This integrated approach using both biological and physicochemical indicators is in a *draft* form and is still being tested. It is hoped the use of this procedure on the South Fork Owyhee River will demonstrate the use of such protocols and will show a rapid, but useful tool for determining support status on large rivers. The comparison to the water quality standards will not be overlooked in this assessment. Appendix D, contains the final Large Rivers assessment scoring.

2.3.1. Overview of Data Collection

Water quality and habitat information on the South Fork Owyhee River is limited. The river is remote with only one easily accessible point in Idaho, the 45 Ranch. In May, 1999, a general river survey was conducted to determine the source of sediments, which was one of the listed pollutants of concern. Suspended sediment and turbidity samples were collected from approximately River Mile 59 (YP Ranch, Nevada) downstream to River Mile 13 (45 Ranch, Idaho). Figure 9, shows the May 1999, monitoring sites, and the permanent sites monitored in June, July, August and September 1999.

Two permanent monitoring sites were set up at the El Paso Pipeline Crossing in Nevada at River Mile 36.8 and at the 45 Ranch (see Figure 9). Samples were collected at these two sites in June, July, August and September. Along with the samples collected in May at the 45 Ranch and the YP Ranch, a five sample set is being used to determine an overall water quality score using a water quality index (WQI).

At the El Paso Pipeline and the 45 Ranch, Hobo™ Temperature Data Loggers were placed in the river. Continuous readings were taken from June 17 through September 20, 1999. Twenty-four hour dissolved oxygen and temperature analysis was conducted in August (due to equipment malfunction, only the El Paso Pipeline information is available).

Macroinvertebrate samples were collected in July, and in August. Periphyton samples were collected on the same dates and sent to Dr. Loren Bahls for analysis.

In September, electro-fishing was conducted at the 45 Ranch. The objective was to conduct a survey for presence/absence of trout species.

The El Paso Pipeline Crossing is being looked upon as a site to determine the condition of water quality and biological indicators for the South Fork Owyhee River in Nevada. In May, only water chemistry information is available at the YP Ranch, twenty miles upstream, rather than the El Paso Pipeline Crossing. It is not expected that the information from the YP Ranch will alter the analysis of the water quality information originating in Nevada. Support of designated beneficial uses in Nevada are not within the scope of this document.

2.3.2. Physicochemical Data

Water quality information was collected in May, June, July, August and September. Two stations were established to collect this information. The El Paso Pipeline Crossing, is located in Nevada, about seven miles south of the Idaho-Nevada state line. The second site is located about twenty four miles downstream at the 45 Ranch. These two sites were chosen based on accessability.

For water chemistry, or physicochemical analysis a scoring mechanism is being utilized. This scoring mechanism uses a "Water Quality Index" (WQI) developed by the State of Oregon (Cude, 1998). Further refinement of the water quality index is described in Grafe et al. (1999 DRAFT). The WQI is modified somewhat to adapt to State of Idaho standards and available information.

All water quality information, except temperature, would indicate state water quality standards/criteria are being achieved in the South Fork Owyhee River. Appendix A, contains all water quality data.

Temperature Data

During the period of June 17 through September 20, 1999, approximately 65% of the monitoring dates showed exceedence of the state water quality criteria for daily maximum temperature. At the El Paso Pipeline, the maximum temperature was 27.1°C. At the 45 Ranch, maximum temperature was 27.0°C. Diurnal temperature changes ranged from 1.8 C° to 11.5 C°. Table 10, shows the temperature results for both stations. Figure 9, shows diurnal changes at both stations for the period.

At the El Paso Pipeline, twenty-four hour monitoring was conducted in August and showed high (>12.00 mg/l) dissolved oxygen (DO) concentrations during the day-light hours, but began "crashing" shortly after the sun set behind the canyon. DO levels did not drop below the state criteria of 6.0 mg/l. Twenty-four hour data is not available at the 45 Ranch, but the limited information collected at this site also indicated a similar trend.

Temperature data was included with the WQI and showed at the El Paso site the WQI's score was 82.3 which places water quality into a "good" category. Without the temperature data, this site increased to a score of 84.8 also a good category. The 45 Ranch score was a 75.4, "poor" category, with the temperature data included, but improved to a 82.1 without the temperature data. The WQI used in these calculations are modified from Cude (1998) and have been designed to work with missing or inadequate data (Grafe et al., 1999 DRAFT).

Water Quality Data:
Except for the temperature data, water quality in the South Fork Owyhee River would be classified as good. Total phosphorus concentrations where slightly higher during the first two months of monitoring. Other data would indicate little impairment of beneficial uses. The state standard for fecal coliform bacteria was not exceeded. There was no indication of organic loading with BOD levels always at 1 mg/l or below. Instantaneous DO measurements were above the State standard of 6.0 mg/l. Turbidity/suspended sediment samples were taken at eight sites during the May reconnaissance trip. Except for the two sites in Nevada, all turbidity results were below 25 Nephelometric Turbidity Units (NTUs). Suspended sediments results varied from 50 to 77 mg/l in Idaho, to 24 to 75 mg/l in Nevada. Appendix A contains all water quality data.

WQI Scores and Analysis
For the El Paso Pipeline Crossing, the WQI was 82.3. This score placed the South Fork Owyhee River at this site in a "good" category. With the removal of temperature data, the score improved to 84.8. At the 45 Ranch, the initial score was 75.4, placing the water quality indicators into a "poor" category. But like the El Paso Pipeline Crossing, the removal of the temperature data improved the score to 82.1. This score would place the water quality at the 45 Ranch into a "good" category.

2.3.3. Macroinvertebrates
Macroinvertebrate data for July and August were compiled through the Large Rivers Protocols (Grafe et al., 1999 DRAFT) and uses the Idaho River Index (IRI) (Royer and Minshall, 1996, 1997 and 1999). The index uses five different metrics: Taxa Richness, Percent Dominance, Percent Elmidea, Percent Predators, and Ephemeroptera-Plecoptera-Trichoptera (EPT) Richness. Both sites indicated at least one cold water indicator, a Diptera species (family-Blephariceridae). Appendix B, contains all macroinvertebrate data and IRI score calculations.

Macroinvertebrates Scores and Analysis
At the El Paso Pipeline Crossing in July, the average IRI Score was 23. This score is the maximum score possible based on the IRI (Grafe et al., 1999 DRAFT). This would indicate the population and species present represent expected communities for this type of a river system. At the 45 Ranch in July, the overall score was lower at 21. This score would indicate some impairment, but still demonstrates that expected species and abundance are still present to indicate support of cold water biota. At both sites in August the IRI was 21. This would indicate that conditions have degraded somewhat at the El Paso Pipeline site, but values obtained for both months would indicate that cold water biota is existing in Idaho. A score below 16, would indicate impairment of cold water biota.

2.3.4. Periphyton Data:

Periphyton samples were collected in July and August. Both sites showed signs of long strains of filamentous algae attached to the substrate. At the 45 Ranch, the coverage was more dominate than at the El Paso Pipeline. This algae is a potential source of organic loading. Samples were sent to Dr. Loren Bahls for analysis and interpretation. Also, the data was run through the Diatom-Idaho Biotic Index (D-IBI).

Dr. Bahls report and interpretation showed full support of cold water biota in Idaho, with minor impairment associated with temperature, organic loading, inorganic nutrients, and slight siltation. Dr. Bahls stressed he did not believe these stressors were serious enough to impair beneficial uses and aquatic life uses. Appendix C contains Dr. Bahl's report, and analysis of species found.

Periphyton Scores and Analysis

The results from Dr. Bahls report were run through the D-IBI. The results were different from Dr. Bahls interpretation (Appendix D). The D-IBI at the El Paso Pipeline site in July showed a score of 42, indicating periphyton species present as expected. At the 45 Ranch on the same date, the data showed a score of 30, which would indicate species present are a deviation from expected conditions. In August, at the El Paso Pipeline, the score was 30, indicating degradation of water quality (or conditions) since July. At the 45 Ranch, the score was 20, which pushed this site below the threshold value and indicates "Not Full Support" of cold water aquatic life at the Idaho site.

2.3.5. Fisheries Data

In September, electro-fishing was conducted at the 45 Ranch. The overall objective was to determine presence/absence of trout species. The electro-fishing of a large system is difficult, and may not allow for an adequate collection of a representative sample. The September survey was performed by DEQ personnel with limited experience in electro-fishing a large river system. Usually spot shocking occurred with a backpack shocker in expected habitat. A 100 meter reach was surveyed, which included one large and deep pool (>1 meters), run/glide reach and a 10 meter riffle.

Fish Analysis

Fish data was not run through the Fish River-Idaho Biotic Index (FR-IBI) (Grafe et al., 1999). The purpose of the survey was to determine presence/absence of trout species only.

By far, the largest bio-mass was suckers with numerous 350 mm species captured. Several age classes of Smallmouth bass were collected. Some sculpins were also found, along with Pike minnow. No trout species were collected. Refer to Table 10, which shows species and numbers found. Past studies by Idaho Fish and Game (Allen et al., 1996) also found similar results. No other information is available, except personal communication with 45 Ranch personnel who indicated they had caught trout from the river.

Habitat would be classified as good. The substrate indicated some siltation, but visual observation revealed less than 10% surface fines in riffle areas. interstitial space is more than adequate for hiding of young of the year for trout species. Two large pools yielded mostly suckers, but no trout. In fast moving riffles, sculpins were found, along with Pike minnow.

Figure 9. May 1999 Monitoring Sites. South Fork Owyhee River

2.4. Data Gaps

Access to the South Fork Owyhee River is limited. Of the thirty miles of the river in the State of Idaho, there is only one passable road and this road may not be passable during winter months or during periods of prolonged precipitation events. A trip to conduct monitoring may involve a 16-18 hour day to sample two sites. The difficulty in reaching monitoring sites has made it difficult to obtain all the data needed to assess the South Fork Owyhee River.

2.4.1. Turbidity

Turbidity is inversely related to the ability of light to pass through a given sample of water. Turbidity can be increased by the presence of both organic and inorganic material suspended within the water column. Usually turbidity is influenced by the amount of suspended sediments within the water column. Since sediments is one of the listed pollutants for the river, it was theorized that turbidity may be one of the pollutants impairing beneficial use support, mainly cold water biota and salmonid spawning. Many of the cold water fisheries rely on site feeding for their food supply. Some macroinvertebrates rely on filtering of the passing water to obtain their food and oxygen.

Turbidity information is limited. During a five day monitoring trip on the South Fork Owyhee River, turbidity samples were collected at sites in Nevada and in Idaho (Figure 9). However, due to the limited holding time for turbidity samples, all samples collected exceeded the recommended holding time for submittal to the laboratory. The data is still important, but may be more of an indicator of inorganic material than organic material. The information obtained in May is also important to determine water quality conditions originating from Nevada.

Obtaining "background" turbidity information may even pose a larger problem. Without long term temporal information, the background levels needed to compare to State of Idaho standards may not be obtainable (IDAPA 16.01.02.250.02.c.iv.).

2.4.2. Sediments

Sediments can impair and affect beneficial uses in a variety of ways. The suspended portion may impair water column clarity, and thus affect cold water species as indicated above. The other form of sediments is bedload sediments. Bedload sediments can alter habitat for both fish and benthic invertebrates by filling in habitat spaces such as pools and the interstitial space between cobbles. Bedload sediments can also cover spawning redds, decreasing the amount of DO required for egg and fry development.

Although limited information is available for overall percent fines and embeddedness, there is a large data gap for pools. Information for pool depth and pool frequency would be important for determining overall impacts to this required habitat. The remoteness of the South Fork Owyhee River and the resources needed to complete an adequate assessment has greatly affected the ability to obtain this information. Aerial photos have assisted to some degree in determining pool frequency, but the use of this resource is skewed due to the fact that most pools are going to be located in areas within the deep canyon and aerial photos cannot adequately show these features. Ideally, pool frequency and pool depth would be required to make an adequate assessment. The limited data available does not allow such a determination. However, the pools observed appear to be able to provide adequate habitat for cold water fisheries.

2.4.3. Paired Watershed Analysis

The East Fork Owyhee River shares many of the same morphology and geomorphology characteristics as the South Fork Owyhee River. A more in-depth analysis of water quality information along with biological indicators would have been beneficial.

2.4.4. Ambient Air Temperature

It is recognized that during the period when water temperature data was being collected, ambient air temperature should have been collected. Ambient air temperature within the South Fork Owyhee River Canyon will not be reflected with any accuracy by the permanent weather stations outside the canyon. The canyon can create micro-weather condition patterns by stratification of air temperatures within the canyon. The greatest factor may be the parent geological materials ability to absorb radiant heat during daytime, then radiate that heat out during cooler nighttime periods. This case can also be made for the substrate material, and may help explain less of a diurnal change in water temperature at the 45 Ranch monitoring site.

2.5. Pollutants of Concern

2.5.1. Temperature

Criteria/Standard

The State of Idaho has established temperature standards to protect both cold water biota and salmonid spawning. These standards are based on an instantaneous monitoring event and/or a daily average. For cold water biota, the standard is a maximum water temperature of 22°C or less with a daily average no greater than 19°C (IDAPA 16.01.2250,04.c). For salmonid spawning, the standard is a maximum water temperature of 13°C or less with a daily average not greater than 9°C (IDAPA 16.01.22.50,05.c.).

Water Quality Impairment

High water temperatures contribute to the depletion of DO and impacts growth and other physiological development of cold water fishes. Salmonids need certain temperatures and DO concentrations for egg development. The State of Idaho DO standard for salmonid spawning is a one (1) day minimum of no less than 6.0 mg/l or ninety (90) percent (%) of saturation, whichever is greater (IDAPA 16.01.02.250,02.d.i.2a). For cold water biota, the standard is for DO concentrations to exceed 6.0 mg/l at all times (IDAPA 16.01.02.250,02.c.i.).

Historical Data

Historic information is lacking or could not be located. Allen (1996) did limited instantaneous temperature monitoring during the fish survey conducted in 1995. Other than this information there is no information available, or the information was not located. The United States Geological Survey (USGS) had at one time four survey sites on the South Fork Owyhee River, all located in Nevada. The nearest station was located near Whiterock, Nevada (Station Number 13177800), near the YP Ranch. This site is located below hay fields and is basically the start of the canyon reach through Nevada to Idaho. The site was in operation from 1955 through 1981. A search of the USGS Web-Page could not locate any historic temperature information (USGS Home-Page, Internet Search, 1999).

Current Water Quality Data

During the period, June 1999 through September 1999, continuous temperature recording devices were placed at two stations on the South Fork Owyhee River. During the period from June 17 through September 20, 1999, approximately 70% of the monitoring dates showed temperatures exceeding state water quality criteria for maximum daily temperature. Table 9 shows a synopsis of temperature results for June 17 through September 20, 1999.

At the El Paso Pipeline, twenty-four hour monitoring was conducted in August and showed high (>12.00 mg/l) dissolved oxygen (DO) concentrations during the day-light hours. DO concentrations did not drop below the state criteria of 6.0 mg/l during the night. Twenty-four hour data is not available at the 45 Ranch, but the limited information collected at this site also indicated a similar trend. Instantaneous DO concentrations were above the state standard of 6.0 mg/l for all monitoring dates in June, July, August and September.

Temperature data were incorporated into the WQI and caused both site's WQI scores to drop. El Paso Pipeline scored 82.3 ("good" water quality), while the 45 Ranch scored a 75.4 ("poor" water quality). Without the temperature data, both sites were in the good water quality category. The WQI used in these calculations are modified from Cude (1998) and have been designed to work with missing or inadequate data (Grafe et al., 1999 DRAFT). Appendix D contains all scoring using the Large Rivers Protocols.

The data also indicates the salmonid spawning temperature standards were exceeded at both stations. For this survey, monitoring was conducted from June 17, 1999 to July 15, 1999 (Table 7). At the El Paso Pipeline site, the average daily standard of 9°C was violated on 100% of the 28 monitoring dates. The maximum daily temperature standard of 13°C was exceeded on 100% of the dates. At the 45 Ranch, the average daily standard was exceeded on 100% of the 28 dates and the maximum instantaneous standard was exceeded on 100% of the dates. See Table 7 for suspected salmonid species presence, and expected dates of spawning activity. Tables 9 and 10 presents a synopsis of water temperature from June 1999 through September 1999.

Table 9. Water Temperature Results, June through September, 1999. South Fork Owyhee River.

Station	Average Daily Temp. (In °C)	% of Days Exceeding 19°C	Maximum Daily Temp. (In °C)	% of Days Exceeding 22°C	Diurnal Changes (In C°)
El Paso Pipeline	19.1	66 %	23.1	62 %	1.8-11.5
45 Ranch	20.4	74 %	23.9	65 %	1.8-7.2

Table 10. Water Temperature Results, June 17 through July 15, 1999. South Fork Owyhee River.

Station	Average Daily Temp. (In °C)	% of Days Exceeding 9°C	Maximum Daily Temp. (In °C)	% of Days Exceeding 13 °C
El Paso Pipeline	20.5	100 %	23.6	100 %
45 Ranch	21.2	100 %	23.5	100%

Sources

Sources for increased temperatures are ambient air temperature, solar radiation, thermal modification (industrial) and/or geothermal input. Geothermal input is limited and is not a source in the South Fork Owyhee River (Idaho Department of Water Resources (IDWR) Map, 1980). There are no known industrial sources that would return warm water to the South Fork Owyhee River. There is one known input from agriculture from River Mile 32 to the confluence with the East Fork Owyhee River, the 45 Ranch. The 45 Ranch may return some water after irrigation of hay fields, but thermal modification would be very limited. Temperature monitoring devices were placed upstream of the agricultural return sites at the 45 Ranch.

Solar Radiation

The South Fork Owyhee River is wide open for solar radiation input. The river runs south to north, with almost constant exposure during the critical summer months. Limited shading is provided by the canyon itself. The river is also wide and shallow. Average depth measurements in August was 1.2 feet at the El Paso Pipeline, while wetted width was 54 feet. A width to depth ratio of 46.5. At the 45 Ranch the average depth was 1.7 feet, and a width of 37.5 feet. A width to depth ratio of 22.3. These width to depth ratios are indicators of high surface area and the exposure to solar radiation that can occur.

Shading

General riverbank and river morphology in the South Fork Owyhee River is influenced by the flashy nature of the river. Peak flows as recorded at the Whiterock Gage usually occur in May or June (USGS, Internet Retrieval, Peak Flows, Station 13177800). However, peak flows can occur anytime from January to June. Early season peak flow is probably associated with rain on snow events, or a rapid melting due to warm ambient air temperatures. The highest discharge recorded at the Whiterock Gage from 1956 to 1981 was 3880 cfs in June 1963. The lowest peak discharge was February 1959 at 84 cfs. As demonstrated in Figure 4, flows can drop as quickly as they rise. For Water Year (WY) 1978-79 the river showed rapid increases in flow, but just as quickly peak flows subsided (Figure 5).

This flashy flow is the predominant cause for lack of established large woody vegetation. Young willows shoots cannot become a dominate feature on point bars or within the floodplain (Moseley, 1999). It is speculated that young sprouts propagate from mature root stock, but the scouring during high flows either destroys young shoots or damages them enough, that previous year's growth is stunted.

Due to the existence of the river terraces, and the confined canyon, ground water storage along the riparian area is lacking. Most river terraces produce sage/basin wildrye communities (Moseley, 1999). Soils in the river terraces are mostly sand to sandy loam material which drains quickly if adequate hydrologic pressure is not present. Little if any capillary action was noted along riverbanks. The lack of a valley-wide floodplain may explain the lack of mature woody species (DEQ, 1999).

Ambient Air Temperature
One of the influences on water temperature in the South Fork Owyhee River is ambient air temperature. With warm water temperatures originating from Nevada and the ambient air temperature, the South Fork Owyhee River may not ever have an opportunity to cool itself enough to meet State of Idaho water quality criteria for cold water biota and salmonid spawning. Appendix A contains all temperature information.

Transport
Temperature is easily influenced by thermal input (solar radiation) and input from external sources (tributaries). Warmer water can easily be transported if physical means (shading, ground water recharge and pools) are not available for cooling. The parent geological material may also contribute to warming of the water. The South Fork Owyhee River meanders through volcanic material or either basalt or rhyolite. Both materials are dark in nature and have high heat absorbing capability. These factors may impact the ability for cooling to occur both within the water column and the ambient air temperature. This may explain the reduced diurnal changes seen at the 45 Ranch compared to the El Paso Pipeline. Figure 10 shows diurnal changes at both stations.

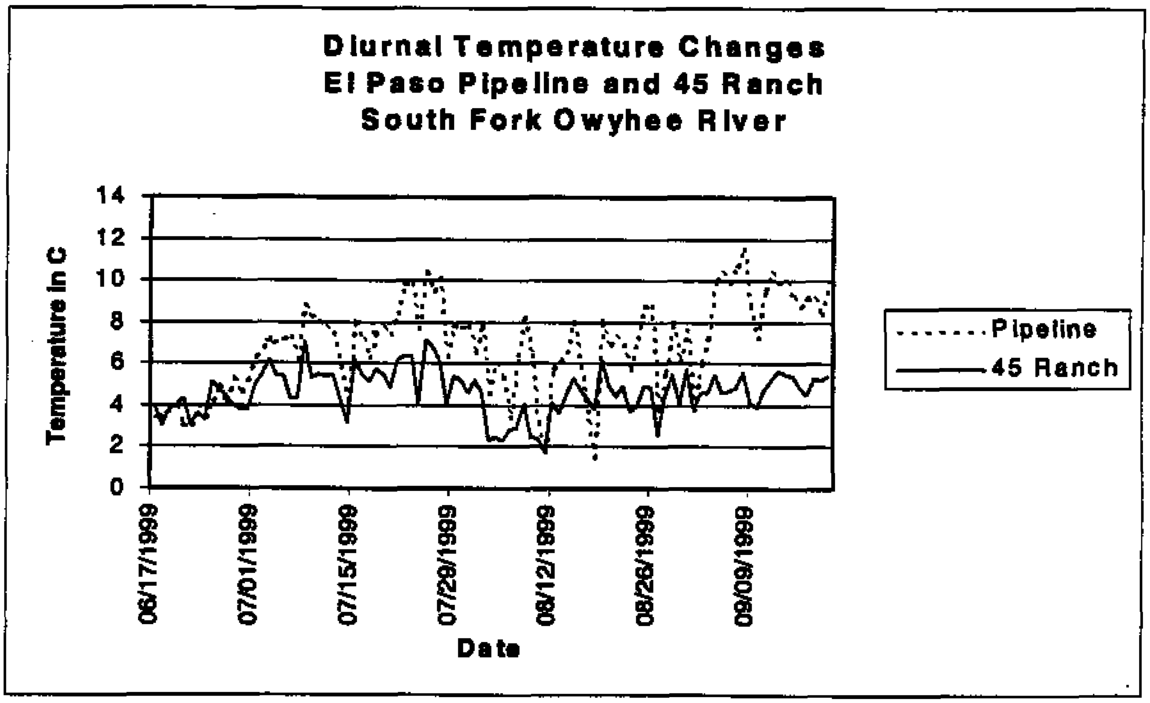


Figure 10. Diurnal Temperature Changes at El Paso Pipeline and 45 Ranch. June through September 1999. South Fork Owyhee River.

Cause of Exceedences of Temperature Standard

The major sources for thermal modifications are solar radiation, ambient air temperature, snowmelt contribution, tributary inflow and other natural conditions (Moore, 1967). For the South Fork Owyhee River, those conditions that may be influenced by anthropogenic sources include river morphology and shading.

Water temperatures exceedences in the South Fork Owyhee River are mainly associated with solar radiation, ambient air temperature, parent geological material effects on ambient air temperature and warm water originating outside Idaho. The South Fork Owyhee River is wide and shallow with high width to depth ratios. Such physical conditions allows for more surface area exposure to ambient air temperature and solar radiation. The parent geological material, basalt and rhyolite, are dark and have high heat absorbing capability (thermal conductivity). This is indicated by the lower diurnal temperature changes at the 45 Ranch than at the El Paso Pipeline site. The 45 Ranch is situated in a steep rhyolite canyon with little vegetation . The El Paso site is more open within the "inner" canyon maintaining less steepness and more vegetation cover. Photos 9, 10, 11 and 13 (Appendix E) shows the open canyon type at the El Paso Pipeline. Photos 4 and 7 (Appendix E) depicts the canyon area directly above the 45 Ranch and the river reach directly below the 45 Ranch.

Geomorphology Conditions

At the El Paso Pipeline diurnal changes ranged from 1.8 to 11.5 C°, at the 45 Ranch diurnal change ranged from 1.8 to 7.2 C°. The reduced diurnal change at the 45 Ranch is probably associated with geomorphology of the area and it's impact on ambient nighttime air temperature. Also, the substrate composition's ability to absorb heat (thermal conductivity) from solar radiation during the day will effect water temperature during periods when cooling should occur (Sinokrot et al., 1994).

Water Temperatures Entering the State

Water temperatures at the El Paso Pipeline and the 45 Ranch often exceed water quality standards. Average maximum daily temperatures were similar at the 45 Ranch and the El Paso Pipeline sites, 27.0° C and 27.1° C respectively. The overall average maximum daily temperatures were equal at 22.8°C for both sites. Daily average temperatures were 1.4 C° warmer at the 45 Ranch from June 17 through September 20, 1999 (Table 10). Figure 11 shows the regression analysis between the El Paso Pipeline site and the 45 Ranch. As demonstrated in Figure 11, there is a correlation between maximum daily water temperature at the El Paso Pipeline and the 45 Ranch. Figure 12 shows the regression analysis for average daily water temperatures. Both regression analysis show a strong correlation between water temperatures entering Idaho and those recorded in Idaho at the 45 Ranch.

Solar Radiation

The general orientation (south to north) of the South Fork Owyhee River should reduce the amount of solar radiation (Moore, 1967). Studies of streams in Oregon showed that those streams with a east-west exposure appeared warmer than those with a south-north, exposure. Vegetation shading of the stream channel would reduce the amount of solar radiation reaching the water surface. Vegetation may become established (mature root stock), but due to the hydrologic conditions of the river, it is not allowed to mature and become a dominant force in river morphology. Willows and other woody species cannot establish themselves in areas close enough to the base flow water levels

to offer any shading. Although solar radiation input or canopy density (there was not any) was not examined, it is believed that the only shading that does occur on the South Fork Owyhee River is associated with geomorphic conditions, the canyon itself.

Anthropogenic Sources

There are no direct anthropogenic point or non-point sources in Idaho that would cause increased water temperature in the South Fork Owyhee River. Besides the small diversion structure at the 45 Ranch, there are no other indication of flow or habitat modification within Idaho. In the Idaho section, assess to the river by cattle is limited. During the May 1999 reconnaissance trip, little evidence of cattle disturbance was noted in Idaho. Moseley (1999) concluded that most of the riparian area, and river terraces, are in a high ecological condition with some minor disturbance by cattle. The Nature Conservancy has integrated some changes to the grazing management plan to reduce cattle assess to portions of the South Fork Owyhee River associated with the grazing allotments of the 45 Ranch (Klahr, 1999 Personal Communication).

Land use in the South Fork Owyhee River upstream from Idaho has more disturbance. Cattle utilization of woody species and the stream side forbes is evident. Although, a reduction in utilization of riparian areas may not have an overall impact on temperature, it may be useful in stream hydrology and reducing sediment sources.

Section 3.0 discusses load capacity and temperature load allocations. These allocations are established to determine reductions required to achieve State of Idaho water quality standards.

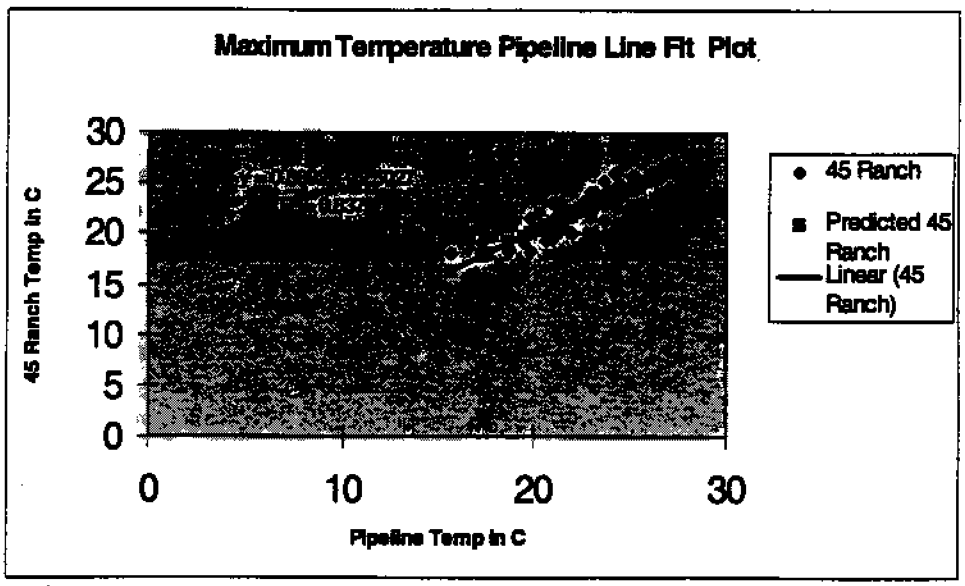


Figure 11. Regression Analysis for Maximum Daily Temperature at El Paso Pipeline and 45 Ranch Sites. June 1999 through September 1999. South Fork Owyhee River.

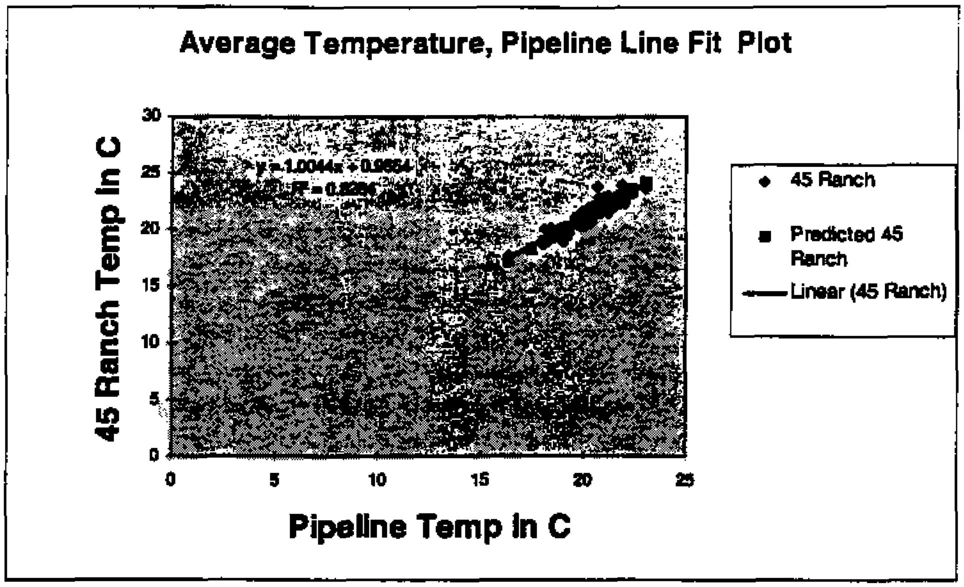


Figure 12. Regression Analysis for Average Daily Temperatures at El Paso Pipeline and 45 Ranch Sites, June through September 1999. South Fork Owyhee River.

2.5.2. Sediment

Criteria/Standards

The State of Idaho utilizes a narrative criteria for sediments within the water quality standards (IDAPA 16.01.02.200.08). This narrative states, "Sediments shall not exceed quantities specified in Sec 250, or in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determination of impairment shall be based on water quality monitoring and surveillance the information utilized in Sub-Section 350.02.b." Section 250 refers to the surface water quality criteria (or standards) to protect designated beneficial uses. The only criteria that would apply to sediments is IDAPA Section 250.02.c.iv., as related to turbidity. Sub-Section 350 relates to administrative action that may be implemented if it is determined that non-point source activity is impairing the designated uses.

Section 16.01.02.053.01 addresses habitat conditions to assess beneficial use support. However, there are no criteria or standards to assess habitat condition to determine or compare for support status.

Water Quality Impairment

Sediments, either suspended or bedload can impair beneficial uses. Suspended sediments can impair sighting feeding fish by reducing their capability to find food. It may also aggravate gills, reducing oxygen intake. Bedload sediment can disturb habitat for macroinvertebrates, filling in interstitial spaces required for spawning and rearing areas, and by filling in pools needed for refuge. In general, sediments usually impact cold water species more than those species associated with warmer waters.

There are a variety of studies to determine the affects of sediments on salmonid species. Sigler et al. (1984) determined that turbidity levels as low as 25 NTUs can cause a reduction in fish growth, and levels between 100-300 NTUs will cause fish to either die, or seek refugee in other channels.

Suspended sediment concentrations at levels of 100 mg/l have shown reduced survival of juvenile rainbow trout (Herbert and Merkins, 1961).

Small mouth bass species (*Micropeterus dolomieui*), found in the South Fork Owyhee River, require adequate substrate for nest building. This substrate could be sand or gravel (Simpson and Wallace, 1982). The sucker species found (*Catostomus macrohelus*) prefer gravel to rocky substrate. Pike minnow (*Ptychocheilus oregonensis*) also were found, and usually prefer cooler waters, and use streams and rivers for spawning activity, but are more of a broadcast spawner than nest builders. Pike minnows are then usually flushed downstream to lakes, in this case, Owyhee Reservoir. However, slow moving rivers can yield Pike minnow (Simpson and Wallace, 1982). Sculpin (*Cottus baird*) were also found in 1999. Sculpin prefer clean waters, and clean gravel for habitat. This specie also usually prefers cool-cold water, and is usually an indicator of good water quality. Table 10 reports species captured in 1999.

Table 11. Number of Fish Captured[1], September 22, 1999 @ 45 Ranch. South Fork Owyhee River.

Species	Trout	Bass	Sucker	Pike Minnow	Sculpin
Number of Individuals	0	34	>30	5	10

[1] Electro-fishing Effort 1640 seconds.

Surface fines can impair benthic species and fisheries by limiting the interstitial space for protection, and suitable substrate for nest or redd construction. Certain primary food sources for fish (Ephemerotera, Plecoptera and Tricoptera) respond positively to a gravel to cobble substrate (Waters, 1995). Substrate surface fine targets are difficult to establish. Most studies have focused on smaller streams, A, B & C Channel Types (Rosgen, 1996). Studies conducted on Rock Creek (Twin Falls County, Idaho) and Bear Valley Creek (Valley County, Idaho) found percent fines above 30% begin to impair embryo survival (IDEQ, 1990). Overton (1995) found natural accumulation of percent fines were about 34% in C channel types. Most C channel types exhibit similar gradient as F channel types, <2.0% (Rosgen, 1996).

Historical Water Quality Data

As with temperature, historic sediment data is lacking, or could not be located. Allen (1995) evaluated substrate in the three locations he conducted fish surveys. Table 12 shows these results. Allen (1996) found almost 81% of the area surveyed in 1995 was suitable fish habitat.

Table 12. Substrate Composition, (Allen 1996) 1995. South Fork Owyhee River.

Location	Latitude	Longitude	% Sand	%Gravel	%Rubble	%Boulders
SFOWY0003.0	N 42°14.77'	W116°54.25'	14.2	36.0	43.5	6.3
SFOWY019.0	N 42°07.89'	W116°49.25'	10.3	13.7	46.7	29.3
SFOWY029.0	N 42°01.68'	W116°51.90'	29.7	3	30.3	37

Current Water Quality Data

In May 1999, a reconnaissance survey and water quality monitoring was conducted on the South Fork Owyhee River. One of the objectives of the May reconnaissance survey was to determine source of sediments and to what extent sediments may be impairing beneficial uses.

Turbidity

Turbidity samples were collected along the river reach from the YP Ranch to the 45 Ranch. The May reconnaissance trip showed turbidity levels slightly above 25 NTUs (26 and 27 NTUs) for the Nevada sites, but samples in Idaho ranged from 21 to 24 NTUs. Overall turbidity results did not show significant decreases in levels from Nevada to Idaho. This would indicate that colloidal material in the water column stays suspended. This would also indicate the eroding riverbanks noted along the Nevada and Idaho sections were not contributing to the overall turbidity at the time of the survey.

Turbidity levels in the remainder of the summer months (June, July, August and September) ranged from 1.3 to 4.8 NTUs at the El Paso Pipeline Site. At the 45 Ranch, turbidity results ranged from 1.8 to 4.6 NTUs. Table 13 shows all the turbidity results for monitoring conducted in 1999.

Table 13. Turbidity Data, South Fork Owyhee River, 1999. South Fork Owyhee River.

Station	YP Ranch Nevada	El Paso Pipeline Nevada	State line Nev-Ida	Bull Camp Idaho	Coyote Hole Idaho	Sentinel Idaho	45 Ranch Idaho
May	26.0	26.0	23.0	24.0	21.0	24.0	24.0
June	NA	3.6	NA	NA	NA	NA	4.3
July	NA	3.9	NA	NA	NA	NA	4.8
August	NA	1.3	NA	NA	NA	NA	1.6
September	NA	3.8	NA	NA	NA	NA	4.0

The data would indicate that there are higher turbidity levels on the falling side of the hydrograph in late spring. However, these turbidity levels dropped during base flow. High turbidity cannot be classified as chronic, but is associated with high flows during snow melt periods or storm events.

Sediments

Very limited data is available for substrate composition. At the two permanent monitoring stations established, Wolman pebble counts were conducted. The results are shown in Table 14.

Table 14. Substrate Composition 1999. South Fork Owyhee River.

Location	Latitude	Longitude	% Sand	%Gravel	%Rubble	%Boulders
El Paso Pipeline	N41°57.7734'	W116°41.0725'	57.0	22.0	15.0	6.0
45 Ranch	N 42°10.5085'	W116°52.2930'	32.0	30.0	19.0	19.0

In July and again in August, macroinvertebrate samples were collected. Ephemerotera, Plecoptera and Tricoptera (EPT) richness data for the 45 Ranch showed a reduced population, or a deviation from expected abundance or occurrence of those species. However, with the available substrate and the overall available habitat, it is not believed that habitat or sediments is the limiting factor for EPT richness. Appendix B contains the macroinvertebrate data.

A report by Dr. Loren Bahls on periphyton (Bahls, 1999; Appendix C) did not indicate siltation was a major influence on benthic species found in 1999. It should be noted that Dr. Bahls report uses indexes developed outside Idaho and the High Desert Ecoregion.

Sources

Riverbanks

The river demonstrates actively eroding riverbanks throughout the reach from the YP Ranch, Nevada, (River Mile 56) to the 45 Ranch (River Mile 13). Erosion is usually limited to one side or the other of the riverbank, with point bars on the opposite bank and/or mid-stream island depositional areas. Point bars and mid-river islands probably shift year to year. The meandering capability is restricted by the canyon. Erosion or cut banks are pushed into the river terraces causing eroding banks that may reach for hundreds of meters. Overall, the river appears to be in an equilibrium for erosion and deposition patterns. What is usually eroded, is deposited somewhere, near, downstream. Colloidal material may stay suspended during peak flows and is probably deposited in Owyhee Reservoir, or the main Owyhee River.

Headwaters

Another source of sediments is the headwaters of the South Fork Owyhee River. The headwaters originate in northern Nevada and take in the Bull Run Mountain range, at an elevation of approximately 9,000 feet. Below the Bull Run Mountains are large cattle operations, the YP Ranch and other agricultural operations. Drainage area above the Whiterock Gaging Station (elevation 4900 feet) is about 1080mi^2 (USGS Internet Retrieval, 1999). Much of the area between the Bull Run Mountains and the Whiterock gaging station is in some form of irrigated agriculture, mostly hay production. Besides normal erosional runoff of sediments, the irrigation induced erosion of the agricultural areas may also be a significant source. To what extent these agricultural areas contribute to the overall sediment increase to the South Fork Owyhee River is not known at this time. Also, the channelization of some stream and river segments in the basin may have altered access to a historic floodplain, reducing the amount of sediment deposition that could occur in that area.

2.6. Data Interpretation for Beneficial Use Support:

Temperature is the limiting factor for support of cold water biota. Habitat appears adequate, with no apparent filling in of pools. This would indicate that sediments, in particular bedload sediments, are not impairing cold water biota. The limited turbidity data would not indicate exceedance of the state instantaneous standard of 50 NTUs (IDAPA 16.01.02.250.02.c.iv). Data is not available to determine if the 25 NTU (for 10 consecutive days) criteria has been exceeded. Turbidity levels found would not hinder sight feeding fish. Also, the presence of filter feeding macroinvertebrates species would back this assumption. Dr. Bahl's periphyton analysis also did not indicate siltation was impairing benthic species (Appendix C).

Since no trout species were found, salmonid spawning would be classified as not supported, once again with temperature being the limiting factor. interstitial space appears adequate for rearing areas, and cobble embeddedness is not limiting the habitat needed for spawning. There is not enough information to determine if Redband trout use this large of a system for spawning, although it has the potential to be a rearing area.

3.0 South Fork Owyhee River Temperature Load Analysis and Allocation

Data collected during June 1999 through September 1999 has demonstrated that water temperatures exceed the Idaho Water Quality Standards and Wastewater Treatment Requirements (water quality standards) for protection of both Cold water biota and Salmonid Spawning. Furthermore, data has demonstrated that temperature standards are exceeded as water enters from the State of Nevada.

Those water bodies determined not to be in full support of the designated beneficial uses, or determined to have impaired beneficial uses associated with exceedances of the water quality standards are to have a TMDL developed. TMDLs are to ensure that the water quality standards are achieved and allow for the full support of designated beneficial uses. TMDLs are defined in 40 CFR Part 130 as the sum of waste load allocations (WLAs) for point sources and load allocations (LAs) for non-point sources, including a margin of safety (MOS).

Analysis has revealed no point sources of thermal loading in Idaho, as well as no anthropogenic non-point thermal loading, thus IDEQ cannot write a TMDL that will meet Idaho criteria based on load control actions in Idaho. We have not investigated sources of thermal loading in Nevada.

In order to meet current legal and schedule obligations IDEQ has prepared a temperature TMDL which makes gross load reduction allotments at the Idaho/Nevada border. These reductions are based on current Idaho stream designations and temperature criteria, and imply substantial thermal load reductions in Nevada. Because thermal loading sources in the Nevada portion of the South Fork Owyhee watershed are unknown at this time, the feasibility of achieving such load reductions in Nevada and meeting Idaho's criteria at the border is not known.

If the South Fork Owyhee River is able to meet Idaho temperature criteria at Idaho/Nevada border the argument could be made that additional increase in Idaho is natural, and develop site-specific criteria. A pending rule change will allow Idaho's natural background clause (IDAPA 16.01.02.070.06) to apply to temperature (IDAPA 16.01.02.070.06). This rule change is expected to be approved by the Idaho legislature in the Spring of 2000. Alternatively, if the South Fork Owyhee river cannot meet Idaho temperature at the border, then it would seem that Idaho and Nevada need to work on jointly developing site-specific criteria.

Which of the above alternatives is the best course forward can not be determined without assistance from Nevada. Further analysis of thermal loading in the South Fork Owyhee River upstream of Idaho and the feasibility of meeting temperature criteria at the border will need to be determined.

3.1. Identified Pollutant Sources and Impacts

Water temperatures must be maintained to achieve water quality standards and support the designated beneficial uses. Redband trout, a cold water species, need cooler water to maintain a viable population for both rearing and egg survival. Current water temperature data indicates that water temperature exceeds the optimum temperature for both activities.

Warm water temperatures in the South Fork Owyhee River in Idaho are associated with solar radiation and the inflow of warm water from the State of Nevada. Solar radiation input can be associated with the high width/depth ratio and the lack of shading of the South Fork Owyhee River. However, the inflow from the State of Nevada appears to be the most significant factor contributing to warm water temperatures.

3.2. Temperature Loading Analysis

Water temperature loading analysis is based on limited data collected during the months of June 1999 through September 1999. Cold water biota criteria is based on this period (IDAPA 16.01.02.250.02.c.ii.). Salmonid spawning criteria is based on the data from June 17 through July 15. Salmonid spawning temperature criteria can be found in the current water quality standards (IDAPA 16.01.02.250.02.d.iv.).

Temperature data collected during the period from June 17 through September 20, 1999 indicated that the water quality standards were exceeded on numerous occasions for both cold water biota and salmonid spawning (Table 9). For cold water biota the entire period will be utilized to determine the load capacity. The period from June 17 through July 15, 1999 will be used to determine the load capacity for salmonid spawning.

Because of the limited water temperature data, n=93 for cold water biota and n=28 for salmonid spawning, maximum temperatures will be utilized for all load calculations. This includes the maximum temperatures (27.1°C at the El Paso Pipeline and 27.0°C at the 45 Ranch) and average temperatures (23.1°C at the El Paso Pipeline and 23.6°C at the 45 Ranch). Similar results will be used for the salmonid spawning period. Table 14 shows the temperatures used for loading calculations.

3.2.1. Load Capacity

As defined in 40 CFR Part 130, a TMDL is the sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for non-point sources, including a margin of safety (MOS). For the South Fork Owyhee River, only non-point sources will be addressed. Load calculations will determine the appropriate load reduction for the State of Nevada to meet State of Idaho water quality standards. See section 2.7.1 for further discussion of the physical features of the watershed which influence the river's ability to meet water quality standards for temperature.

Load capacity is based on the water quality standards. For cold water biota the load capacity is 22°C for the maximum temperature and 19°C average temperature. For salmonid spawning, the load capacity is 13°C for maximum temperature and 9°C for the average temperature load capacity.

The mass-energy balance formula used in determining load allocations and reductions use a steady state, conservation of mass and conservation of energy approach. The mathematical relationships are derived from the Paradise Creek TMDL (IDEQ, 1997). This method uses a characteristic seep inflow temperature which is compared with ambient and target water temperature for an estimated percent (%) reduction in total energy load. The formula utilized is:

$$\% \text{ Reduction} = \left((T_{current} - T_{seep}) - (T_{standard} - T_{seep}) \right) / \left(T_{current} - T_{seep} \right)$$

Tables 15 and 16 show the overall maximum and average temperature reductions required to achieve State of Idaho water quality standards (load capacity) in Nevada. Load reductions represent both the cold water biota criteria and the salmonid spawning criteria.

Table 15. Current Maximum Temperature, Load Capacity and Load Allocation and Reductions Required to Achieve Load Capacity and Allocation. South Fork Owyhee River.

	Current Maximum Temperature °C	Maximum Temperature Load Capacity °C	Reduction Required for Capacity (%)
At State line			
Cold Water Biota	27.1	22.0	27%
Salmonid Spawning	27.1	13.0	78%

Table 16. Current Average Temperature, Load Capacity and Load Allocation and Reductions Required to Achieve Load Capacity and Allocation. South Fork Owyhee River.

	Current Daily Average Temperature °C	Daily Average Temperature Load Capacity °C	Reduction Required for Capacity (%)
At State line			
Cold Water Biota	23.1	19.0	28%
Salmonid Spawning	23.1	9.0	97%

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5.0 Glossary of Acronyms

AUMs-Animal Units Months

BOD-Biological

CFR-Code of Federal Regulations

CFU-Colony Forming Units

CWA-Clean Water Act

D-IBI-Diatom- Idaho Biotic Index (Periphyton)

DO-Dissolved Oxygen

EPT-Ephemeroptera-Plecoptera-Tricoptera

FR-IBI-Fish Rivers- Idaho Biotic Index (Fish)

HUC-Hydrologic Unit Code

IDAPA-Idaho Water Quality Standards and Wastewater Requirements

IRI-Idaho Rivers Index (Macroinvertebrates)

NTU-Nephelometric Turbidity Units

PRN-Pacific Northwest River

USDA-United States Department of Agriculture

USEPA-United States Environmental Protection Agency

USGS-United States Geological Survey

USDA-United States Department of Agriculture

USEPA-United States Environmental Protection Agency

WQI-Water Quality Index

WQI-Water Quality Index

WY-Water Year (October 1st through September 30th)

6.0 Temperature Conversion Table

Temp in °C	Temp in °F	Temp in °C	Temp in °F	Temp in °C	Temp in °F
0	32	18	64.4	36	96.8
1	33.8	19	66.2	37	98.6
2	35.6	20	68	38	100.4
3	37.4	21	69.8	39	102.2
4	39.2	22	71.6	40	104
5	41	23	73.4	41	105.8
6	42.8	24	75.2	42	107.6
7	44.6	25	77	43	109.4
8	46.4	26	78.8	44	111.2
9	48.2	27	80.6	45	113
10	50	28	82.4	46	114.8
11	51.8	29	84.2	47	116.6
12	53.6	30	86	48	118.4
13	55.4	31	87.8	49	120.2
14	57.2	32	89.6	50	122
15	59	33	91.4		
16	60.8	34	93.2		
17	62.6	35	95		

Appendix A. Water Quality and Water Temperature Information

Water Quality Monitoring Results. South Fork Owyhee River at El Paso Pipeline, Nevada.

Date	Alkalinity (mg/l)	BOD-5 (mg/l)	Dissolved O-P (manual)	Hardness (mg/l)	Total Ammonia mg/l)	Total NO3 (mg/l)	Total P (mg/l)	Total residue (mg/l)	Turbidity (NTU)	pH (SU)	Total Coliform (CFU/100ml)	E. coli (CFU/100ml)	Fecal Coliform (CFU/100ml)
09/21/1999	148	<1	0.013	124	0.008	0.015	0.026	243	3.8	8.01	10,000	8	12
08/16/1999		<1	0.027	120	0.017	0.026	0.043	202	1.3	8.47	2400	6	< 2
07/13/1999		1			0.015	0.007	0.031	211	3.9	9.21	1,986	4	16 EST
06/14/1999		<1			0.01	0.005	0.113	197	3.6			22	
Average	148	1	0.02	122	0.0125	0.01325	0.0533	213.25	3.15	8.563	4795	10	10
Maximum	148	1	0.027	124	0.017	0.026	0.113	243	3.9	8.47	10000	22	2
Minimum	148	<1	0.013	120	0.008	0.005	0.026	197	1.3	8.01	1986	4	16
Std. Deviation			0.010	2.828	0.004	0.010	0.040	20.662	1.240	0.605	4512.124	8.165	#DIV/0!
Count	1	4	2	2	4	4	4	4	4	3	3	4	3

Water Quality Monitoring Results. South Fork Owyhee River at 45 Ranch, Idaho

Table-- Monitoring S.F. Owyhee River @ 45 Ranch

Date	Alkalinity (mg/l)	BOD-5 (mg/l)	Dissolved O-P (manual)	Hardness (mg/l)	Total Ammonia mg/l)	Total NO3 (mg/l)	Total P (mg/l)	Total residue (mg/l)	Turbidity (NTU)	pH (SU)	Total Coliform (CFU/100ml)	E. coli (CFU/100ml)	Fecal Coliform (CFU/100ml)
09/21/1999	123	<1	0.006	88	0.01	0.012	0.024	229	4	8.23	1300	<4	<2
08/17/1999		1	0.013	108	0.007	0.005	0.029	202	1.6	8.73	2400	1	<2
07/13/1999		<1			0.014	0.005	0.031	218	4.8	9.15	2400	3	2 EST
06/14/1999		<1			0.013	0.025	0.112	206	4.3			10	
05/11/1999		1			0.017	0.044	0.202	269	24		1400	46	50 EST
Average			0.0095	98	0.0122	0.0182	0.0796	224.8	7.74	8.703	1875	15	15
Maximum			0.013	108	0.017	0.044	0.202	202	24	9.15	2400	46	<2
Minimum			0.003	88	0.007	0.005	0.024	269	1.6	8.23	1300	1	50
Std. Deviation			0.005	14.142	0.004	0.017	0.078	26.883	9.173	0.461	607.591	21.024	#DIV/0!
Count	1	5	2	2	5	5	5	5	5	3	3	5	4

Water Quality Monitoring Results. South Fork Owyhee River at YP Ranch, Nevada.

Date	Alkalinity (mg/l)	BOD-5 (mg/l)	Dissolved O-P (manual)	Hardness (mg/l)	Total Ammonia mg/l)	Total NO3 (mg/l)	Total P (mg/l)	Total residue (mg/l)	Turbidity (NTU)	pH (SU)	Total Coliform (CFU/100ml)	E. coli (CFU/100ml)	Fecal Coliform (CFU/100ml)
5-11-99		1			0.013	<0.005	0.166	244			880	30	

Water Quality Monitoring Results. East Fork Owyhee River at Crutcher's Crossing , Nevada

Date	Alkalinity (mg/l)	BOD-5 (mg/l)	Dissolved O-P (manual)	Hardness (mg/l)	Total Ammonia mg/l)	Total NO3 (mg/l)	Total P (mg/l)	Total residue (mg/l)	Turbidity (NTU)	pH (SU)	Total Coliform (CFU/100ml)	E. coli (CFU/100ml)	Fecal Coliform (CFU/100ml)
08/16/1999		1	0.03	82	0.018	<0.005	0.045	168	1.6	8.23	>2400	3	6

Stream Name.	SF Owyhee
Station:	Pipeline
Calculated OWQI=	82.3846075
Stream Classification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp (C)	DOmg/L	pH	FecalColi	Total Solids	nh3+no2+no	TPmg/L	BOD5
1999	5	12	4.00	10.00	8.00	20	244.000	0.018	0.186	1
1999	6	14	20.90	7.92	8.32	22	197.000	0.015	0.113	1
1999	7	13	24.30	10.60	8.77	18	211.000	0.022	0.031	1
1999	8	17	20.00	10.00	9.00	2	202.000	0.043	0.043	1
1999	9	22	12.80	11.25	8.01	12	243.000	0.023	0.028	1

slt	sldo	slbod	slph	slts	slnit	sltp	sltc	OWQI
100	98.52537	81.92926	100	80.67981	99.1745	50.27245	98	81.40942
69.50553	84.39655	81.92926	84.66004	86.58432	99.31181	66.15014	98	81.5348
45.40222	100	81.92926	67.06847	84.76796	98.99199	90.71411	98	74.97254
74.61255	98.52537	81.92926	59.52408	85.91844	98.03928	87.1195	98	82.01836
97.96544	100	81.92926	99.48257	80.80074		92.21185	98	91.88793

Stream Name.	SF Owyhee
Station	Pipeline
Calculated OWQI=	84.7915864
Stream Classification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp (C)	DOmg/L	pH	FecalColi	Total Solids	nh3+no2+no	TPmg/L	BOD5
1999	5	12		10.00	8.00	20	244.000	0.018	0 186	1
1999	6	14		7 92	8.32	22	197.000	0.015	0.113	1
1999	7	13		10 80	8.77	16	211.000	0.022	0.031	1
1999	8	17		10 00	9.00	2	202.000	0.043	0 043	1
1999	9	22		11.25	8 01	12	243.000	0 023	0.026	1

sit	sido	sibod	siph	sits	sinit	sitp	sifc		OWQI
	98.62537	81.92926	100	80.67961	99.1745	50.27245	98		79.51845
	84.39655	81.92926	84.66004	96.56432	99.31161	66.15014	98		83.81753
	100	81.92926	87.06647	84.76796	98.99189	90.71411	98		88.36003
	98.52537	81.92926	99.62498	85.91844	98.03928	87.1195	98		83 287
	100	81.92926	99.46257	80.60074		92.21185	98		90 97692

Stream Name:	SF Owyhee
Station:	45 Ranch
Calculated OWQI=	75.4462312
Stream Classification	Poor

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp (C)	DOmg/L	pH	FecalColi	Total Solids	nh3+no2+no	TPmg/L	BOD5
1999	5	12	4.00	10.00	8.00	40	269.000	0.081	0.202	1
1999	6	14	24.00	8.00	8.41	10	206.000	0.038	0.112	1
1999	7	13	26.00	7.50	8.15	2	218.000	0.019	0.031	1
1999	8	17	22.00	9.20	8.73	2	188.000	0.023	0.045	1
1999	9	22	20.30	12.67	8.23	2	229.000	0.022	0.024	1

sit	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
100	98.52537	81.92926	100	77.7145	97.22097	39.48715	98	73.80095
47.84447	85.18399	81.92926	80.84007	85.4052	98.28528	68.44972	98	74.32987
30.38503	80.07352	81.92926	85.08861	83.88361	99.12884	90.71411	98	60.45604
62.58274	94.52491	81.92926	66.47475	90.40738	98.94841	88.52039	98	81.9253
72.98759	100	81.92926	88.75256	82.81303		92.81095	98	86.71839

Stream Name	SF Owyhee
Station	45 Ranch
Calculated OWQI=	82 1319047
Stream Classsification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp (C)	DOmg/L	pH	FecalColi	Total Solids	nh3+no2+no	TPmg/L	BOD5
1999	5	12		10.00	8.00	48	269.000	0.061	0 202	1
1999	6	14		8.00	8 41	10	206.000	0.038	0.112	1
1999	7	13		7.50	9.15	2	218.000	0.019	0.031	1
1999	8	17		9.20	8.73	2	168.000	0.023	0.045	1
1999	9	22		12.67	8.23	2	229.000	0.022	0.024	1

sit	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
	96.52537	81.92926	100	77.7145	97.22997	39.46715	98	71.51171
	85.16399	81.92926	80.84097	85.4052	98.26528	66 44972	98	83.20434
	80.07352	81.92926	65.06681	83.88381	99.12884	90 71411	98	79.61975
	94.52491	81.92926	88.47475	90.40736	98.94641	86.52039	98	88 462
	100	81.92926	88.75265	82.81303		92.81095	98	89.88173

Pipeline

Date	High	Low	Average
17-Jun-99	22.9	19.4	21.11
18-Jun-99	23.7	20.2	21.79
19-Jun-99	22.9	19.3	21.03
20-Jun-99	23.1	19.3	21.13
21-Jun-99	23.2	20.1	21.48
22-Jun-99	21.5	16.5	18.91
23-Jun-99	22.2	18.3	20.08
24-Jun-99	23.1	19.7	21.17
25-Jun-99	22.5	18.3	20.35
26-Jun-99	21.7	16.6	19.05
27-Jun-99	21	16.8	18.57
28-Jun-99	21.7	16.5	18.86
29-Jun-99	22.4	17.9	19.85
30-Jun-99	23.7	18.5	20.81
01-Jul-99	23.9	17.6	20.62
02-Jul-99	23.9	17.2	20.38
03-Jul-99	23.6	16.4	19.69
04-Jul-99	22.9	15.9	19.25
05-Jul-99	22.9	15.7	18.97
06-Jul-99	24.3	17	20.11
07-Jul-99	25.5	19.3	21.95
08-Jul-99	24.8	16	20
09-Jul-99	24.4	16.2	20.13
10-Jul-99	25.5	17.5	21.09
11-Jul-99	26.5	18.6	22.33
12-Jul-99	27.1	19.7	23.06
14-Jul-99	24.4	20.2	22.11
15-Jul-99	24.4	16.4	20.31
16-Jul-99	24.1	16.9	20.37
17-Jul-99	23.2	16.9	19.94
18-Jul-99	23.7	16.2	19.57
19-Jul-99	23.9	16.2	19.97
20-Jul-99	24.4	17	20.42
21-Jul-99	25.3	16.9	20.74
22-Jul-99	25	16.1	20.81
23-Jul-99	26.2	16.4	21.09
24-Jul-99	24.4	16.7	20.21
25-Jul-99	26.5	16.1	20.78
26-Jul-99	26.7	17.2	21.57
27-Jul-99	27	16.6	21.81
28-Jul-99	24.1	17.7	20.86
29-Jul-99	26.1	17.2	20.77
30-Jul-99	25.3	17.5	20.95
31-Jul-99	24.8	17	20.89
01-Aug-99	24.4	17.8	20.86
02-Aug-99	25.6	17.8	21.63
03-Aug-99	23.7	19.1	21.16
04-Aug-99	23.7	17.6	20.44
05-Aug-99	22.6	17.3	19.84
06-Aug-99	20.2	16.7	18.35
07-Aug-99	21.9	15.4	18.03
08-Aug-99	23.6	15.4	19.11
09-Aug-99	22.9	16.5	19.75
10-Aug-99	19.5	16.7	18.09
11-Aug-99	17.2	15.4	16.36
12-Aug-99	20.4	14.6	17.39
13-Aug-99	21.8	15.9	18.63
14-Aug-99	21.9	15.3	18.3
15-Aug-99	23.1	15.1	18.64
18-Aug-99	20.96	19.42	20.19
19-Aug-99	24.4	16.39	20.21
20-Aug-99	23.83	16.76	20.25
21-Aug-99	24.01	16.76	20.4
22-Aug-99	25.17	16.38	21.11
23-Aug-99	24.4	16.99	20.86
24-Aug-99	24.4	17.14	20.46
25-Aug-99	24.79	16	20.17
26-Aug-99	25.17	16.38	20.81
27-Aug-99	21.33	17.52	19.25
28-Aug-99	21.33	15.62	18.61
29-Aug-99	23.24	15.23	19.18
30-Aug-99	21.71	15.62	18.07
31-Aug-99	19.42	11.77	15.09
01-Sep-99	15.62	11.77	13.78
02-Sep-99	17.52	11.39	14.15
03-Sep-99	18.66	11.39	14.59
04-Sep-99	19.81	9.82	14.56
05-Sep-99	20.95	10.6	15.58
06-Sep-99	20.95	10.99	15.62
07-Sep-99	20.95	10.21	15.43
08-Sep-99	21.71	10.21	15.83
09-Sep-99	21.33	12.55	16.5
10-Sep-99	19.81	12.55	16.01
11-Sep-99	20.95	11.38	15.86
12-Sep-99	20.57	10.21	15.16
13-Sep-99	20.57	10.6	15.51
14-Sep-99	21.33	11.39	16.12
15-Sep-99	20.57	11.39	16.01
16-Sep-99	20.19	11.38	15.95
17-Sep-99	20.57	11.38	15.74
18-Sep-99	21.33	12.16	16.33
19-Sep-99	20.95	12.55	16.34
20-Sep-99	21.33	11.39	16.14
Average	22.6	15.9	19.1
Max	27.1	20.2	23.1
Min	15.6	9.8	13.8
Count	93.0	93.0	93.0
SD	2.2	2.8	2.2

45 Ranch

Date	High	Low	Average
17-Jun-99	24.1	20.1	21.94
18-Jun-99	23.8	20.6	22.27
19-Jun-99	23.8	20	21.90
20-Jun-99	24.1	20.1	22.15
21-Jun-99	24.1	19.8	22.09
22-Jun-99	21.8	18.7	20.28
23-Jun-99	22.4	18.8	20.55
24-Jun-99	23.1	19.8	21.48
25-Jun-99	23.1	18	20.73
26-Jun-99	22.3	17.5	19.86
27-Jun-99	21.8	17.2	19.39
28-Jun-99	21.4	17.4	19.37
29-Jun-99	22.6	18.6	20.55
30-Jun-99	23.4	19.6	21.47
01-Jul-99	23.8	18.8	21.35
02-Jul-99	24	18.5	21.22
03-Jul-99	23.6	17.4	20.41
04-Jul-99	22.1	16.7	19.69
05-Jul-99	21.8	16.4	18.97
06-Jul-99	22.6	18.3	20.32
07-Jul-99	24.6	20.3	22.33
08-Jul-99	24.3	17.2	20.73
09-Jul-99	23.6	18.3	20.89
10-Jul-99	24.6	19.3	22.02
11-Jul-99	25.9	20.5	23.06
12-Jul-99	26.4	20.9	23.6
14-Jul-99	25.1	21.9	23.41
15-Jul-99	24.1	17.9	21
16-Jul-99	24.4	18.9	21.53
17-Jul-99	24.2	19.1	21.57
18-Jul-99	24.1	18.3	21.03
19-Jul-99	24.2	18.7	21.52
20-Jul-99	24.6	19.7	22.05
21-Jul-99	24.6	18.4	21.45
22-Jul-99	25.3	18.9	21.86
23-Jul-99	26.1	19.7	22.61
24-Jul-99	24.1	20	21.87
25-Jul-99	25.6	18.3	21.62
26-Jul-99	26.5	19.7	22.91
27-Jul-99	27	20.9	23.89
28-Jul-99	26	21.9	23.65
29-Jul-99	25.8	20.4	22.81
30-Jul-99	25.6	20.4	22.87
31-Jul-99	24.2	18.8	22.15
01-Aug-99	25.1	19.9	22.37
02-Aug-99	24.8	20.2	22.89
03-Aug-99	24.2	21.8	22.91
04-Aug-99	22	20.5	21.98
05-Aug-99	22.5	20.2	21.52
06-Aug-99	22	19.2	20.19
07-Aug-99	20	17.1	18.61
08-Aug-99	21.4	17.3	19.37
09-Aug-99	21.9	19.4	20.81
10-Aug-99	21.5	19.1	19.96
11-Aug-99	19.1	17.3	17.69
12-Aug-99	20.7	16.5	18.44
13-Aug-99	21.9	18.3	19.83
14-Aug-99	21.9	17.4	19.56
15-Aug-99	22.4	17.1	19.65
18-Aug-99	23	19.2	21.42
19-Aug-99	24.7	18.5	21.53
20-Aug-99	25.2	20.2	22.58
21-Aug-99	24.2	19.6	22.07
22-Aug-99	24.5	18.5	21.95
23-Aug-99	24.7	21	22.81
24-Aug-99	24.2	20.2	22.21
25-Aug-99	24.2	19.2	21.57
26-Aug-99	24.7	19.9	22.25
27-Aug-99	23.1	20.5	21.37
28-Aug-99	22.5	18	20.18
29-Aug-99	23.8	18	20.87
30-Aug-99	22.3	18.2	20.25
31-Aug-99	19.2	13.4	16.49
01-Sep-99	18	14.2	16.47
02-Sep-99	18	13.4	16.09
03-Sep-99	18.2	13.6	16.03
04-Sep-99	18.2	12.7	15.67
05-Sep-99	19.5	14.9	17.05
06-Sep-99	20.8	16.1	18.14
07-Sep-99	19.8	14.9	17.33
08-Sep-99	20.3	14.7	17.4
09-Sep-99	20.3	16.1	18.07
10-Sep-99	20	16.1	17.93
11-Sep-99	20.3	16.5	17.83
12-Sep-99	19.3	14.1	16.7
13-Sep-99	20.2	14.5	17.05
14-Sep-99	20.5	15	17.03
15-Sep-99	20.6	15.2	17.73
16-Sep-99	20.5	15.8	17.90
17-Sep-99	20.3	15.8	17.93
18-Sep-99	21.1	16.6	18.2
19-Sep-99	21.3	16.1	18.39
20-Sep-99	20.6	15.2	17.69
Average	22.8	18.2	20.4
Max	27.0	21.9	23.9
Min	18.0	12.7	15.7
Count	93.0	93.0	93.0
SD	2.2	2.2	2.1

Pipeline

Date	High	Low	Average
17-Jun-99	22.9	19.4	21.11
18-Jun-99	23.7	20.2	21.79
19-Jun-99	22.9	19.3	21.03
20-Jun-99	23.1	19.3	21.13
21-Jun-99	23.2	20.1	21.48
22-Jun-99	21.5	18.5	19.91
23-Jun-99	22.2	18.3	20.08
24-Jun-99	23.1	19.7	21.17
25-Jun-99	22.5	18.3	20.35
26-Jun-99	21.7	16.8	19.05
27-Jun-99	21	16.8	18.57
28-Jun-99	21.7	16.5	18.86
29-Jun-99	22.4	17.8	19.85
30-Jun-99	23.7	18.5	20.81
01-Jul-99	23.9	17.6	20.62
02-Jul-99	23.9	17.2	20.36
03-Jul-99	23.6	16.4	19.69
04-Jul-99	22.9	15.9	19.25
05-Jul-99	22.9	15.7	18.97
06-Jul-99	24.3	17	20.11
07-Jul-99	25.5	19.3	21.95
08-Jul-99	24.8	16	20
09-Jul-99	24.4	16.2	20.13
10-Jul-99	25.5	17.5	21.09
11-Jul-99	26.5	18.8	22.33
12-Jul-99	27.1	19.7	23.05
14-Jul-99	24.4	20.2	22.11
15-Jul-99	24.4	16.4	20.31
Avg	23.56	17.98	20.54
Max	27.1	20.2	23.05
Min	21	15.7	18.57
Count	28	28	28
SD	1.46	1.46	1.12

45 Ranch

Date	High	Low	Average
17-Jun-99	24.1	20.1	21.94
18-Jun-99	23.6	20.6	22.27
19-Jun-99	23.8	20	21.93
20-Jun-99	24.1	20.1	22.15
21-Jun-99	24.1	19.8	22.09
22-Jun-99	21.8	18.7	20.28
23-Jun-99	22.4	18.8	20.55
24-Jun-99	23.1	19.8	21.48
25-Jun-99	23.1	18	20.73
26-Jun-99	22.3	17.5	19.88
27-Jun-99	21.6	17.2	19.39
28-Jun-99	21.4	17.4	19.37
29-Jun-99	22.6	18.8	20.55
30-Jun-99	23.4	19.6	21.47
01-Jul-99	23.8	18.8	21.35
02-Jul-99	24	18.5	21.22
03-Jul-99	23.6	17.4	20.41
04-Jul-99	22.1	16.7	19.69
05-Jul-99	21.8	16.4	18.97
06-Jul-99	22.6	18.3	20.32
07-Jul-99	24.6	20.3	22.33
08-Jul-99	24.3	17.2	20.73
09-Jul-99	23.6	18.3	20.89
10-Jul-99	24.8	19.3	22.02
11-Jul-99	25.9	20.5	23.05
12-Jul-99	26.4	20.9	23.6
14-Jul-99	25.1	21.9	23.41
15-Jul-99	24.1	17.9	21
	23.50	18.89	21.18
	26.4	21.9	23.6
	21.4	16.4	18.97
	28	28	28
	1.26	1.40	1.21

Data Source Name: DEQ
Waterbody Name: S. Fork Owyhee R.
Data Collection Site: 45Ranch2

Idaho

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:
Data Period: 06/17/99 - 07/12/99

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl	S-spawn	Nbr of Msrmts per day	7-Day Average of High
2	17-Jun-99	24.00	20.00	21.87	J	S	15	
3	18-Jun-99	23.50	20.70	22.20	J	S	15	
4	19-Jun-99	23.70	20.00	21.88	J	S	15	
5	20-Jun-99	24.00	20.00	22.06	J	S	15	
6	21-Jun-99	24.20	19.70	22.05	J	S	15	
7	22-Jun-99	21.80	18.70	20.25	J	S	15	
8	23-Jun-99	22.50	18.70	20.53	J	S	15	23.39
9	24-Jun-99	23.20	19.80	21.45	J	S	15	23.27
10	25-Jun-99	23.20	18.10	20.72	J	S	15	23.23
11	26-Jun-99	22.30	17.40	19.89	J	S	15	23.03
12	27-Jun-99	21.70	17.10	19.35	J	S	15	22.70
13	28-Jun-99	21.30	17.30	19.33	J	S	15	22.29
14	29-Jun-99	22.30	18.70	20.47	J	S	15	22.36
15	30-Jun-99	23.30	19.50	21.44	J	S	15	22.47
16	01-Jul-99	23.50	18.70	21.26	J	S	15	22.51
17	02-Jul-99	23.80	18.60	21.09	J	S	15	22.60
18	03-Jul-99	23.50	17.30	20.33	J	S	15	22.77
19	04-Jul-99	22.00	16.80	19.59	J	S	15	22.81
20	05-Jul-99	21.70	16.50	18.97	J	S	15	22.87
21	06-Jul-99	22.60	18.20	20.26	J	S	15	22.91
22	07-Jul-99	24.50	20.20	22.28	J	S	15	23.09
23	08-Jul-99	23.80	17.10	20.58	J	S	15	23.13
24	09-Jul-99	23.30	18.20	20.69	J	S	15	23.06
25	10-Jul-99	24.40	19.40	21.75	J	S	15	23.19
26	11-Jul-99	25.40	20.50	22.81	J	S	15	23.67
27	12-Jul-99	25.90	21.00	23.35	J	S	15	24.27

Idaho Cold Water Biota Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
22 °C Instantaneous	21	81%	
19 °C Average	25	96%	
Days Evaluated & Date Range	26	17-Jun	12-Jul

Idaho Salmonid Spawning Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
13 °C Instantaneous Spring	0		
9 °C Average Spring	0		
Spring Days Eval'd w/in Dates	0	01-Jun	15-Jun
13 °C Instantaneous Fall	0		
9 °C Average Fall *	0		
Fall Days Eval'd w/in Dates	0	01-Aug	15-Aug
13 °C Instantaneous Total *	0		
9 °C Average Total *	0		
Tot Days Eval'd w/in Both Dates *	0		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
12 °C Juvnl Rearing Daily Avg (J)	26	100%	
Juvenile Days Eval'd w/in Dates	26	01-Jun	30-Sep
9 °C Spawning Daily Average (S)	26	100%	
Spawning Days Eval'd w/in Dates	26	01-Jun	30-Sep

EPA Bull Trout Criteria Exceedance Summary

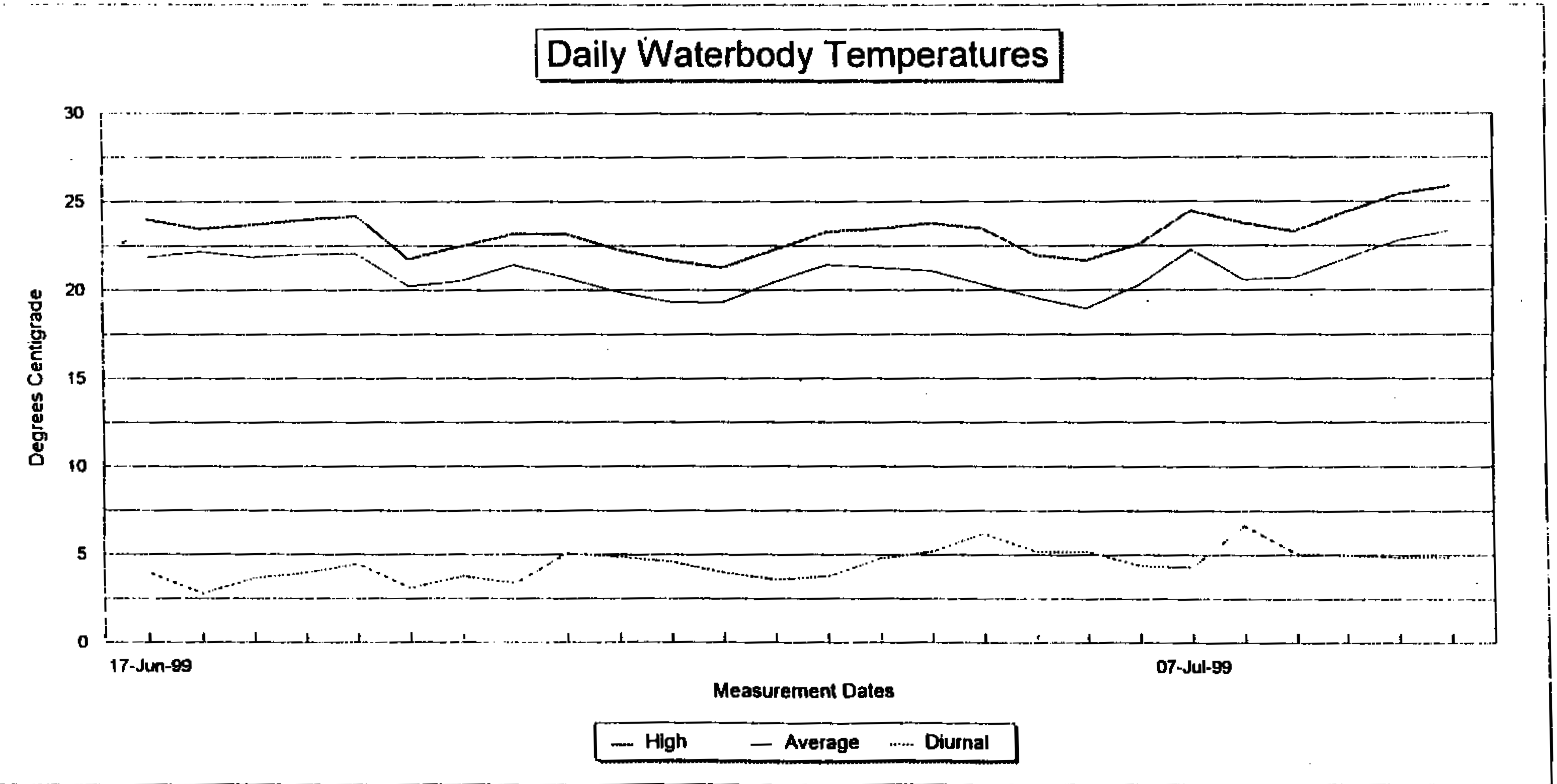
Criteria	Exceedance Counts Nmbr	Prcnt	
10 °C 7-Day Avg of Daily Max	0	0%	
Nmbr of 7-Day Avg's w/in Dates	20	01-Jun	30-Sep

Notes:

DEQ Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: S. Fork Owyhee R.
Data Collection Site: 45Ranch2
Period Covered by Graph: 06/17/99 - 07/12/99

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:



Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: 45 Ranch

HUC4 Number: 1705010!
HUC4 Name: South Fork Owyhe
South of the Salmon Clearwater Divid
Idaho Bull Trout Elevation: 99999 N
Waterbody ID Number: 12
Data Period: 07/20/96 - 09/29/9

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl S-spawn		Nbr of Msrmts per day	7-Day Average of High
1	18-Aug-99	22.09	21.33	21.79			5	
2	19-Aug-99	24.01	18.28	21.20			20	
3	20-Aug-99	24.79	19.81	22.23			20	
4	21-Aug-99	23.63	19.42	21.75			20	
5	22-Aug-99	24.01	19.42	21.70			20	
6	23-Aug-99	24.40	20.57	22.44			20	
7	24-Aug-99	24.01	20.19	21.91			20	23.85
8	25-Aug-99	24.01	18.66	21.24			20	24.12
9	26-Aug-99	24.40	19.42	21.77			20	24.18
10	27-Aug-99	22.48	19.81	20.91			20	23.85
11	28-Aug-99	21.71	17.52	19.73			20	23.57
12	29-Aug-99	22.48	17.90	20.38			20	23.36
13	30-Aug-99	21.33	17.52	19.63			20	22.92
14	31-Aug-99	18.66	13.32	16.24			20	22.15
15	01-Sep-99	17.52	14.09	16.07			20	21.23
16	02-Sep-99	17.52	13.32	15.79			20	20.24
17	03-Sep-99	17.14	13.32	15.56			20	19.48
18	04-Sep-99	22.09	11.77	15.47			20	19.53
19	05-Sep-99	22.09	12.55	15.90			20	19.48
20	06-Sep-99	24.01	12.55	16.33			20	19.86
21	07-Sep-99	24.40	10.21	15.73			20	20.68
22	08-Sep-99	26.34	9.82	16.21			20	21.94
23	09-Sep-99	22.48	12.16	16.20			20	22.65
24	10-Sep-99	26.73	12.55	16.64			20	24.02
25	11-Sep-99	26.73	9.82	15.98			20	24.68
26	12-Sep-99	19.81	7.83	10.38			10	24.36

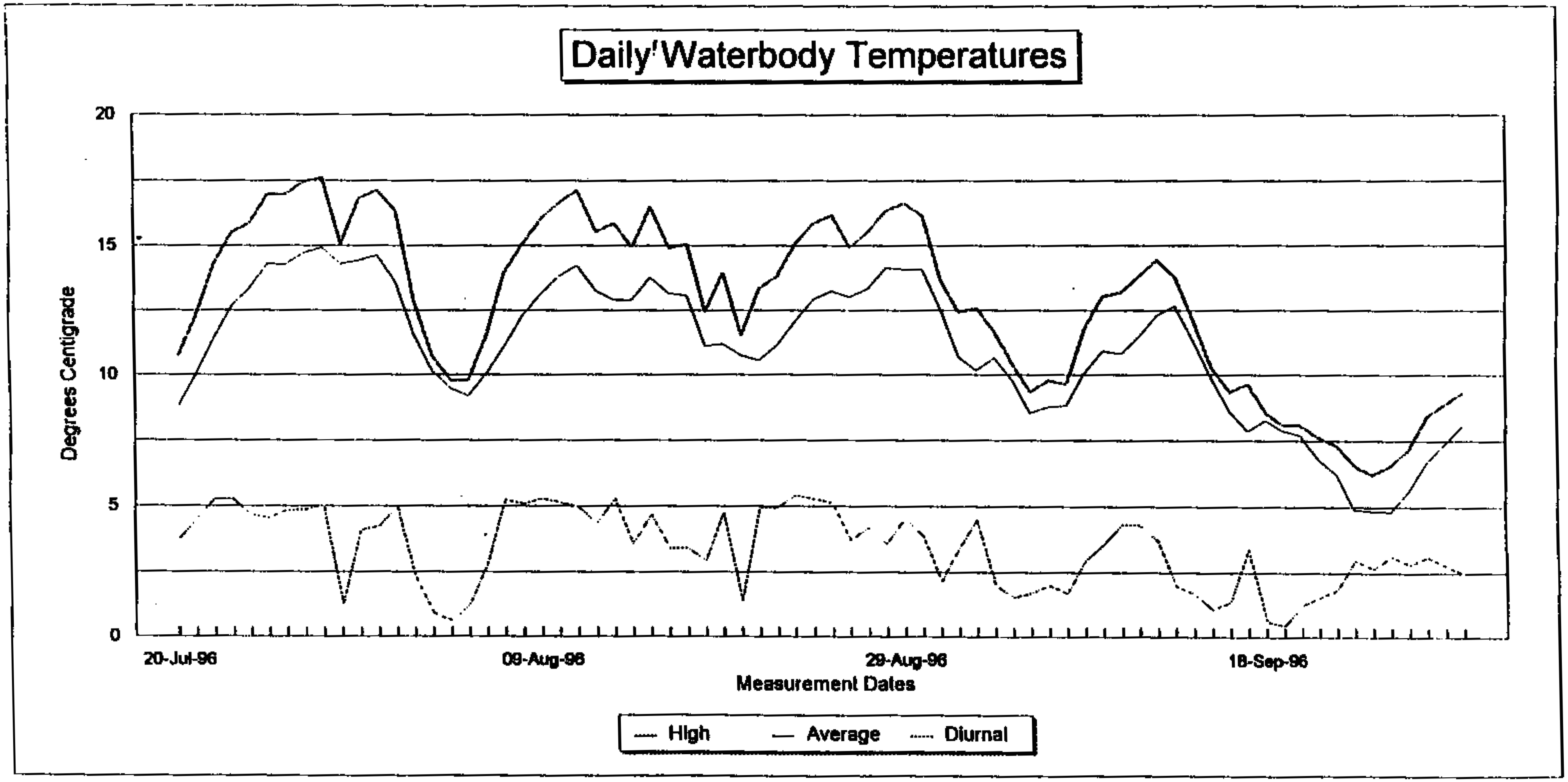
DATA REVIEW

Please review the daily temperatures and scan the "Number of Measurements per Day" to verify that a full set of measurements exist. Often the first line and the last line contain invalid data that may scew results. After review of the data delete any rows that have invalid data. To delete rows highlight the rows you want deleted. Use either the Delete-Row icon or on the menu click Edit, Delete, Row, and press OK. This process will delete the row. It is important that you delete the row of invalid data, not just erase the data or blank out the field where the data exists. The program takes its counts from the rows of data so please use the above described processes to delete rows. After deleting undesired rows of data you may press the button named "Exceedances" to calculate the instances that exceed the temperature criteria. If, after calculating exceedances, you find more rows of data that need deleting simply follow the above procedures and delete those rows and press the Exceedance button again.

DEQ Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: 45 Ranch
Period Covered by Graph: 07/20/96 - 09/29/96

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number: 123



Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: S. Fork Owyhee
Data Collection Site: S. Fork Owyhee R., Pipeline

Nevada

HUC4 Number: 1705010
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:
Data Period: 06/17/99 - 07/12/99

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl	S-spawn	Nbr of Msrmts per day	7-Day Average of High
2	17-Jun-99	22.80	19.30	21.05	J	S	15	
3	18-Jun-99	23.60	20.10	21.74	J	S	15	
4	19-Jun-99	22.90	19.30	20.96	J	S	15	
5	20-Jun-99	22.90	19.10	21.04	J	S	15	
6	21-Jun-99	23.10	19.90	21.36	J	S	15	
7	22-Jun-99	21.40	18.30	19.81	J	S	15	
8	23-Jun-99	22.10	18.20	19.97	J	S	15	22.69
9	24-Jun-99	22.90	19.60	21.11	J	S	15	22.70
10	25-Jun-99	22.60	18.20	20.26	J	S	15	22.56
11	26-Jun-99	21.60	16.70	18.96	J	S	15	22.37
12	27-Jun-99	20.90	16.90	18.50	J	S	15	22.09
13	28-Jun-99	21.60	16.40	18.79	J	S	15	21.87
14	29-Jun-99	22.40	17.70	19.75	J	S	15	22.01
15	30-Jun-99	23.80	18.30	20.73	J	S	15	22.26
16	01-Jul-99	24.00	17.50	20.55	J	S	15	22.41
17	02-Jul-99	24.00	17.00	20.29	J	S	15	22.61
18	03-Jul-99	23.40	16.20	19.60	J	S	15	22.87
19	04-Jul-99	22.90	15.90	19.15	J	S	15	23.16
20	05-Jul-99	22.80	15.80	18.91	J	S	15	23.33
21	06-Jul-99	24.10	16.90	20.01	J	S	15	23.57
22	07-Jul-99	25.30	19.30	21.86	J	S	15	23.79
23	08-Jul-99	24.60	15.90	19.93	J	S	15	23.87
24	09-Jul-99	24.60	16.10	20.03	J	S	15	23.94
25	10-Jul-99	25.50	17.40	21.04	J	S	15	24.24
26	11-Jul-99	26.60	18.80	22.33	J	S	15	24.77
27	12-Jul-99	26.90	19.60	23.01	J	S	15	25.36

Idaho Cold Water Biota Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
22 °C Instantaneous	22	85%	
19 °C Average	22	85%	
Days Evaluated & Date Range	26	17-Jun	12-Jul

Idaho Salmonid Spawning Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
13 °C Instantaneous Spring	0		
9 °C Average Spring	0		
Spring Days Eval'd w/in Dates	0	01-Jun	15-Jun
13 °C Instantaneous Fall	0		
9 °C Average Fall	0		
Fall Days Eval'd w/in Dates	0	01-Aug	15-Aug
13 °C Instantaneous Total *	0		
9 °C Average Total *	0		
Tot Days Eval'd w/in Both Dates *	0		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
12 °C Juvnl Rearing Daily Avg (J)	26	100%	
Juvenile Days Eval'd w/in Dates	26	01-Jun	30-Sep
9 °C Spawning Daily Average (S)	26	100%	
Spawning Days Eval'd w/in Dates	26	01-Jun	30-Sep

EPA Bull Trout Criteria Exceedance Summary

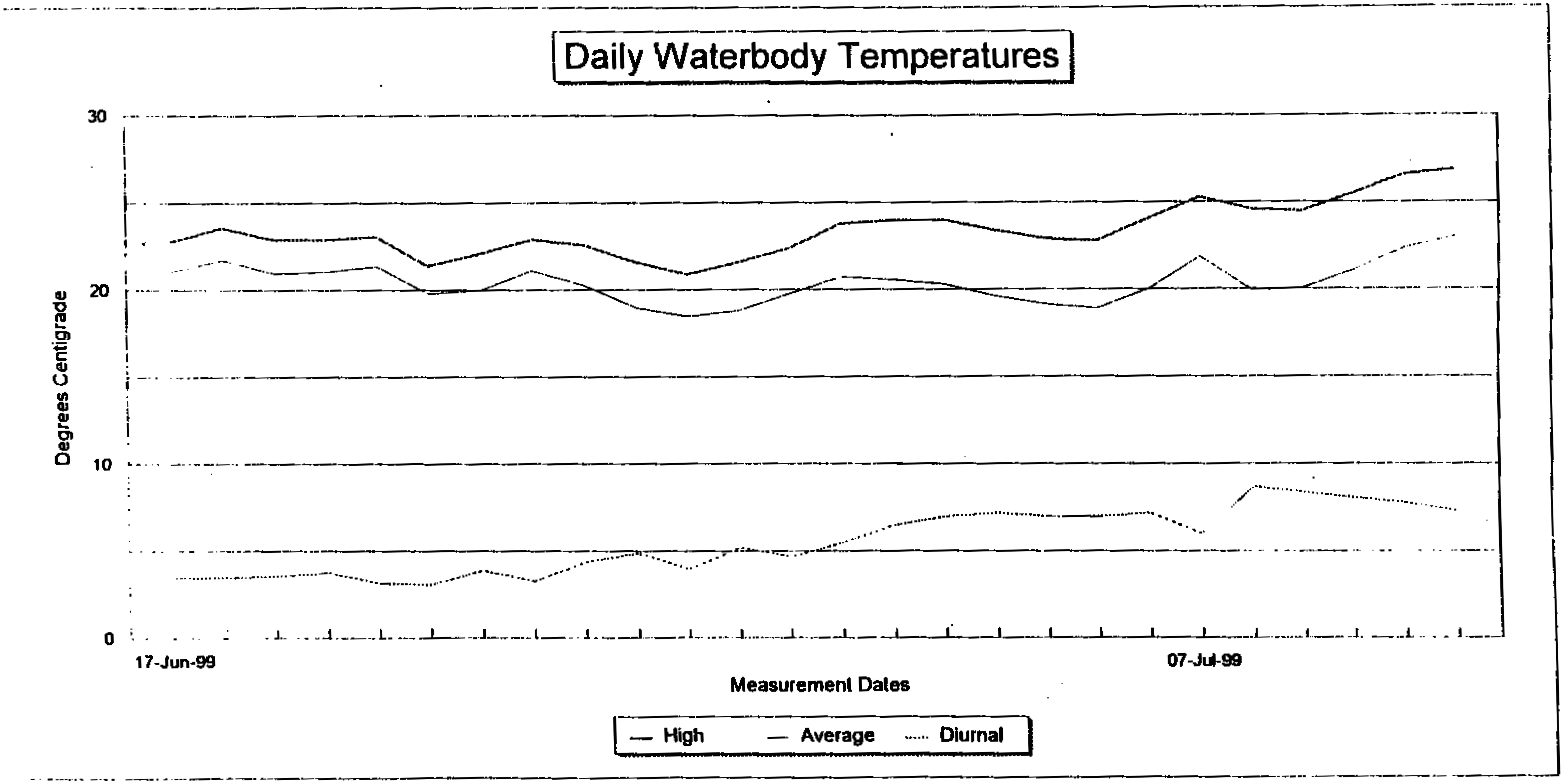
Criteria	Exceedance Counts Nmbr	Prcnt	
10 °C 7-Day Avg of Daily Max	0	0%	
Nmbr of 7-Day Avg's w/in Dates	20	01-Jun	30-Sep

Notes:

DEQ Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: S. Fork Owyhee
Data Collection Site: S. Fork Owyhee R., Pipeline
Period Covered by Graph: 06/17/99 - 07/12/99

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:



Source File Name: c:\logbook\pipe1.txt

Graph Page 1

Data Source Name: DEQ
Waterbody Name: SF Owyhee River
Data Collection Site: Pipeline, Site 2

HUC4 Number: 17010105
HUC4 Name: Moyie
North of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:
Data Period: 07/14/99 - 08/15/99

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl S-spawn	Nbr of Msrmts per day	7-Day Average of High
2	14-Jul-99	24.40	20.20	22.11	J	15	
3	15-Jul-99	24.40	16.40	20.31	J	15	
4	16-Jul-99	24.10	16.90	20.37	J	15	
5	17-Jul-99	23.20	16.90	19.94	J	15	
6	18-Jul-99	23.70	16.20	19.57	J	15	
7	19-Jul-99	23.90	16.20	19.97	J	15	
8	20-Jul-99	24.40	17.00	20.42	J	15	24.01
9	21-Jul-99	25.30	16.90	20.74	J	15	24.14
10	22-Jul-99	26.00	16.10	20.81	J	15	24.37
11	23-Jul-99	26.20	16.40	21.09	J	15	24.67
12	24-Jul-99	24.40	16.70	20.21	J	15	24.84
13	25-Jul-99	26.50	16.10	20.78	J	15	25.24
14	26-Jul-99	28.70	17.20	21.57	J	15	25.64
15	27-Jul-99	27.00	16.90	21.81	J	15	26.01
16	28-Jul-99	24.10	17.70	20.66	J	15	25.84
17	29-Jul-99	25.10	17.20	20.77	J	15	25.71
18	30-Jul-99	25.30	17.50	20.95	J	15	25.59
19	31-Jul-99	24.80	17.00	20.89	J	15	25.64
20	01-Aug-99	24.40	17.80	20.95	J	15	25.34
21	02-Aug-99	25.80	17.80	21.63	J	15	25.19
22	03-Aug-99	23.70	19.10	21.16	J	15	24.71
23	04-Aug-99	23.70	17.80	20.44	J	15	24.66
24	05-Aug-99	22.60	17.30	19.84	J	15	24.30
25	06-Aug-99	20.20	16.70	18.35	J	15	23.57
26	07-Aug-99	21.90	15.40	18.03	J	15	23.16
27	08-Aug-99	23.60	15.40	19.11	J	15	23.04
28	09-Aug-99	22.90	16.50	19.75	J	15	22.66
29	10-Aug-99	19.80	16.70	18.09	J	15	22.10
30	11-Aug-99	17.20	15.40	16.36	J	15	21.17
31	12-Aug-99	20.40	14.60	17.39	J	15	20.86
32	13-Aug-99	21.90	15.80	18.63	J	15	21.10
33	14-Aug-99	21.90	15.30	18.30	J	15	21.10
34	15-Aug-99	23.10	15.10	18.64	J	15	21.03

Idaho Cold Water Biota Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
22 °C Instantaneous	26	79%	
19 °C Average	25	76%	
Days Evaluated & Date Range	33	14-Jul	15-Aug

Idaho Salmonid Spawning Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
13 °C Instantaneous Spring	19	100%	
9 °C Average Spring	19	100%	
Spring Days Eval'd w/in Dates	19	01-Apr	01-Aug
13 °C Instantaneous Fall	14	100%	
9 °C Average Fall	15	107%	
Fall Days Eval'd w/in Dates	14	01-Aug	30-Sep
13 °C Instantaneous Total *	33	100%	
9 °C Average Total *	34	103%	
Tot Days Eval'd w/in Both Dates *	33		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
12 °C Juvnl Rearing Daily Avg (J)	33	100%	
Juvenile Days Eval'd w/in Dates	33	01-Jun	31-Aug
9 °C Spawning Daily Average (S)	0		
Spawning Days Eval'd w/in Dates	0	01-Sep	30-Oct

EPA Bull Trout Criteria Exceedance Summary

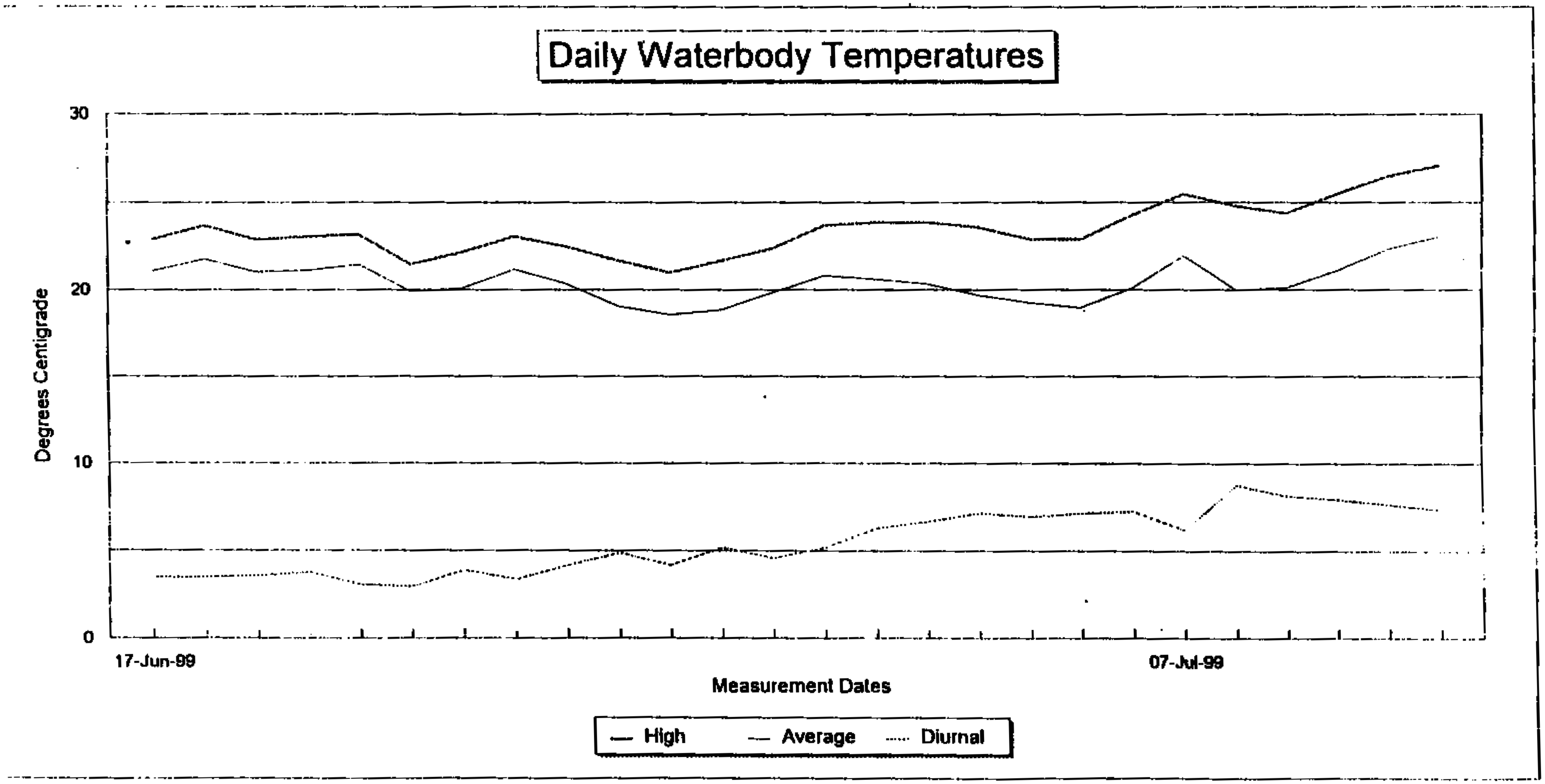
Criteria	Exceedance Counts Nmbr	Prcnt	
10 °C 7-Day Avg of Daily Max	27	100%	
Nmbr of 7-Day Avg's w/in Dates	27	01-Jun	30-Sep

Notes:

DEQ Summary of Temperature Data

)ata Source Name: DEQ
Naterbody Name: S. Fork Owyhee R.
)ata Collection Site: S. Fork Owyhee R., Pipeline2
Period Covered by Graph: 06/17/99 - 07/12/99

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number:



Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: Pipeline

HUC4 Number: 1705010
HUC4 Name: South Fork Owyhe
South of the Salmon Clearwater Divid
Idaho Bull Trout Elevation: 99999
Waterbody ID Number: 12
Data Period: 08/18/99 - 09/20/9

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl S-spawn	Nbr of Msrmts per day	7-Day Average of High
1	18-Aug-99	20.95	19.42	20.19	J	5	
2	19-Aug-99	24.40	16.38	20.21	J	20	
3	20-Aug-99	23.63	16.76	20.25	J	20	
4	21-Aug-99	24.01	16.76	20.40	J	20	
5	22-Aug-99	25.17	18.28	21.11	J	20	
6	23-Aug-99	24.40	18.66	20.95	J	20	
7	24-Aug-99	24.40	17.14	20.46	J	20	23.85
8	25-Aug-99	24.79	16.00	20.17	J	20	24.40
9	26-Aug-99	25.17	16.38	20.61	J	20	24.51
10	27-Aug-99	21.33	17.52	19.26	J	20	24.18
11	28-Aug-99	21.33	15.62	18.61	J	20	23.80
12	29-Aug-99	23.24	15.23	19.18	J	20	23.52
13	30-Aug-99	21.71	15.62	18.07	J	20	23.14
14	31-Aug-99	19.42	11.77	15.05	J	20	22.43
15	01-Sep-99	15.62	11.77	13.78	S	20	21.12
16	02-Sep-99	17.52	11.38	14.15	S	20	20.02
17	03-Sep-99	18.66	11.38	14.59	S	20	19.64
18	04-Sep-99	19.81	9.82	14.56	S	20	19.43
19	05-Sep-99	20.95	10.60	15.58	S	20	19.10
20	06-Sep-99	20.95	10.99	15.62	S	20	18.99
21	07-Sep-99	20.95	10.21	15.43	S	20	19.21
22	08-Sep-99	21.71	10.21	15.83	S	20	20.08
23	09-Sep-99	21.33	12.55	16.60	S	20	20.62
24	10-Sep-99	19.81	12.55	16.01	S	20	20.79
25	11-Sep-99	20.95	11.38	15.86	S	20	20.95
26	12-Sep-99	20.57	10.21	15.16	S	20	20.90
27	13-Sep-99	20.57	10.60	15.51	S	20	20.84
28	14-Sep-99	21.33	11.38	16.12	S	20	20.90
29	15-Sep-99	20.57	11.38	16.01	S	20	20.73
30	16-Sep-99	20.19	11.38	15.95	S	20	20.57
31	17-Sep-99	20.57	11.38	15.74	S	20	20.68
32	18-Sep-99	21.33	12.16	16.33	S	20	20.73
33	19-Sep-99	20.95	12.55	16.34	S	20	20.79
34	20-Sep-99	21.33	11.38	16.14	S	20	20.90

Idaho Cold Water Biota
Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
22 °C Instantaneous	9	26%	
19 °C Average	11	32%	
Days Evaluated & Date Range	34	18-Aug	20-Sep

Idaho Salmonid Spawning
Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
13 °C Instantaneous Spring	0		
9 °C Average Spring	0		
Spring Days Eval'd w/in Dates	0	01-Apr	01-Aug
13 °C Instantaneous Fall	34	100%	
9 °C Average Fall	34	100%	
Fall Days Eval'd w/in Dates	34	01-Aug	30-Sep
13 °C Instantaneous Total *	34	100%	
9 °C Average Total *	34	100%	
Tot Days Eval'd w/in Both Dates *	34		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout
Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
12 °C Juvnl Rearing Daily Avg (J)	14	100%	
Juvenile Days Eval'd w/in Dates	14	01-Jun	31-Aug
9 °C Spawning Daily Average (S)	20	100%	
Spawning Days Eval'd w/in Dates	20	01-Sep	30-Oct

EPA Bull Trout
Criteria Exceedance Summary

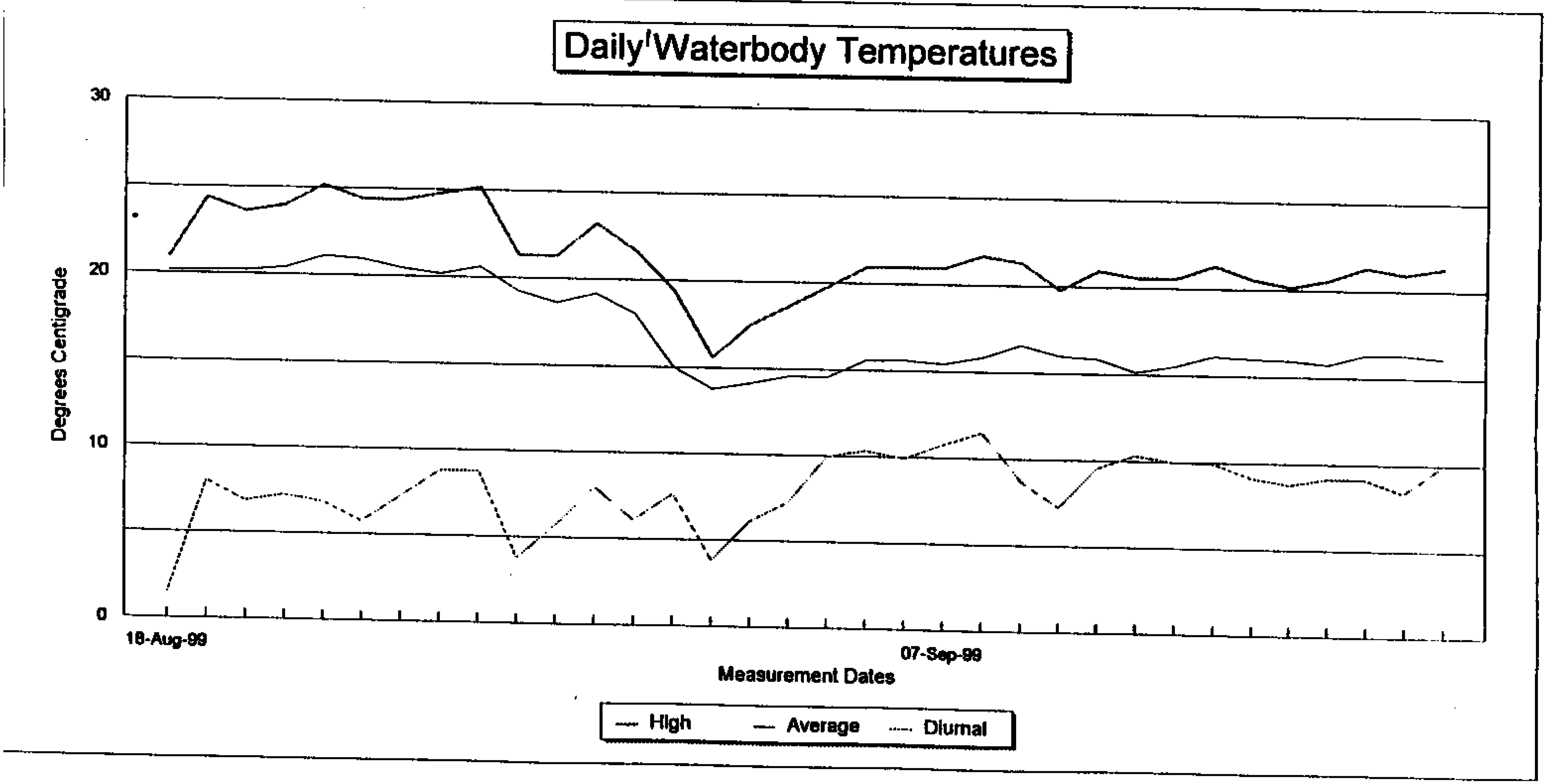
Criteria	Exceedance Counts Nmbr	Prcnt	
10 °C 7-Day Avg of Daily Max	28	100%	
Nmbr of 7-Day Avg's w/in Dates	28	01-Jun	30-Sep

Notes:

DEQ Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: Pipeline
Period Covered by Graph: 08/18/99 - 09/20/99

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number: 122



Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: Pipeline 2

HUC4 Number: 1705010
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number: 12
Data Period: 08/18/99 - 09/20/99

Dbase Day Count	Date of Measurement	High Temp	Low Temp	Average Temp	BullExcd J-juvnl S-spawn	Nbr of Msrmts per day	7-Day Average of High
1	18-Aug-99	20.95	19.42	20.19	J	5	
2	19-Aug-99	24.40	16.38	20.21	J	20	
3	20-Aug-99	23.63	16.76	20.25	J	20	
4	21-Aug-99	24.01	16.76	20.40	J	20	
5	22-Aug-99	25.17	18.28	21.11	J	20	
6	23-Aug-99	24.40	18.66	20.95	J	20	
7	24-Aug-99	24.40	17.14	20.46	J	20	23.85
8	25-Aug-99	24.79	16.00	20.17	J	20	24.40
9	26-Aug-99	25.17	16.38	20.61	J	20	24.51
10	27-Aug-99	21.33	17.52	19.25	J	20	24.18
11	28-Aug-99	21.33	15.62	18.61	J	20	23.80
12	29-Aug-99	23.24	15.23	19.18	J	20	23.52
13	30-Aug-99	21.71	15.62	18.07	J	20	23.14
14	31-Aug-99	19.42	11.77	15.05	J	20	22.43
15	01-Sep-99	15.62	11.77	13.78	S	20	21.12
16	02-Sep-99	17.52	11.38	14.15	S	20	20.02
17	03-Sep-99	18.66	11.38	14.59	S	20	19.64
18	04-Sep-99	19.81	9.82	14.56	S	20	19.43
19	05-Sep-99	20.95	10.60	15.58	S	20	19.10
20	06-Sep-99	20.95	10.99	15.62	S	20	18.99
21	07-Sep-99	20.95	10.21	15.43	S	20	19.21
22	08-Sep-99	21.71	10.21	15.83	S	20	20.08
23	09-Sep-99	21.33	12.55	16.60	S	20	20.62
24	10-Sep-99	19.81	12.55	16.01	S	20	20.79
25	11-Sep-99	20.95	11.38	15.86	S	20	20.95
26	12-Sep-99	20.57	10.21	15.16	S	20	20.90
27	13-Sep-99	20.57	10.60	15.51	S	20	20.84
28	14-Sep-99	21.33	11.38	16.12	S	20	20.90
29	15-Sep-99	20.57	11.38	16.01	S	20	20.73
30	16-Sep-99	20.19	11.38	15.95	S	20	20.57
31	17-Sep-99	20.57	11.38	15.74	S	20	20.68
32	18-Sep-99	21.33	12.16	16.33	S	20	20.73
33	19-Sep-99	20.95	12.55	16.34	S	20	20.79
34	20-Sep-99	21.33	11.38	16.14	S	20	20.90

Idaho Cold Water Biota Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
22 °C Instantaneous	9	26%	
19 °C Average	11	32%	
Days Evaluated & Date Range	34	18-Aug	20-Sep

Idaho Salmonid Spawning Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
13 °C Instantaneous Spring	0		
9 °C Average Spring	0		
Spring Days Eval'd w/in Dates	0	01-Apr	01-Aug
13 °C Instantaneous Fall	34	100%	
9 °C Average Fall	34	100%	
Fall Days Eval'd w/in Dates	34	01-Aug	30-Sep
13 °C Instantaneous Total *	34	100%	
9 °C Average Total *	34	100%	
Tot Days Eval'd w/in Both Dates *	34		

* If spring & fall dates overlap double counting may occur.

Idaho Bull Trout Criteria Exceedance Summary

Criteria	Exceedance Counts Nmbr	Prcnt	
12 °C Juvnl Rearing Daily Avg (J)	14	100%	
Juvenile Days Eval'd w/in Dates	14	01-Jun	31-Aug
9 °C Spawning Daily Average (S)	20	100%	
Spawning Days Eval'd w/in Dates	20	01-Sep	30-Oct

EPA Bull Trout Criteria Exceedance Summary

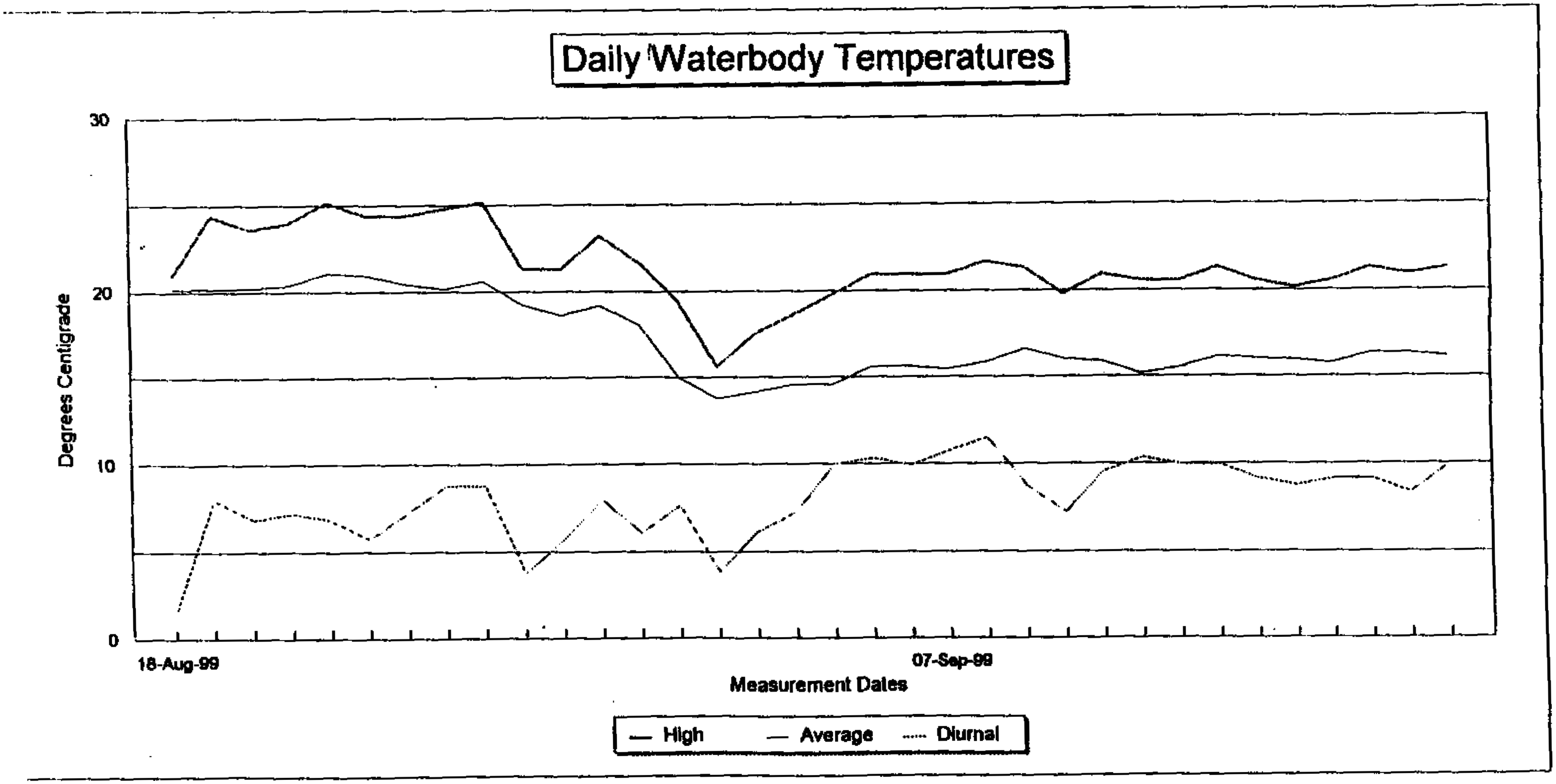
Criteria	Exceedance Counts Nmbr	Prcnt	
10 °C 7-Day Avg of Daily Max	28	100%	
Nmbr of 7-Day Avg's w/in Dates	28	01-Jun	30-Sep

Notes:

DEQ Summary of Temperature Data

Data Source Name: DEQ
Waterbody Name: SF Owyhee
Data Collection Site: Pipeline 2
Period Covered by Graph: 08/18/99 - 09/20/99

HUC4 Number: 17050105
HUC4 Name: South Fork Owyhee
South of the Salmon Clearwater Divide
Idaho Bull Trout Elevation: 99999 M
Waterbody ID Number: 121



High Temperature Regression Output, June 17 through July 15, 1999

High Temperature

Date	Pipeline	45 Ranch
17-Jun-99	22.9	24.1
18-Jun-99	23.7	23.6
19-Jun-99	22.9	23.8
20-Jun-99	23.1	24.1
21-Jun-99	23.2	24.1
22-Jun-99	21.5	21.8
23-Jun-99	22.2	22.4
24-Jun-99	23.1	23.1
25-Jun-99	22.5	23.1
26-Jun-99	21.7	22.3
27-Jun-99	21	21.6
28-Jun-99	21.7	21.4
29-Jun-99	22.4	22.6
30-Jun-99	23.7	23.4
01-Jul-99	23.9	23.8
02-Jul-99	23.9	24
03-Jul-99	23.6	23.6
04-Jul-99	22.9	22.1
05-Jul-99	22.9	21.8
06-Jul-99	24.3	22.6
07-Jul-99	25.5	24.6
08-Jul-99	24.8	24.3
09-Jul-99	24.4	23.6
10-Jul-99	25.5	24.8
11-Jul-99	26.5	25.9
12-Jul-99	27.1	26.4
14-Jul-99	24.4	25.1
15-Jul-99	24.4	24.1

SUMMARY OUTPUT

Salmonid Spawning High Temperature Regression Output

Regression Statistics	
Multiple R	0.823242005
R Square	0.677727399
Adjusted R Square	0.640690362
Standard Error	0.712464921
Observations	28

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	28.82350425	28.82350425	56.78000472	5.33229E-08
Residual	27	13.70613861	0.507634763		
Total	28	42.52964286			

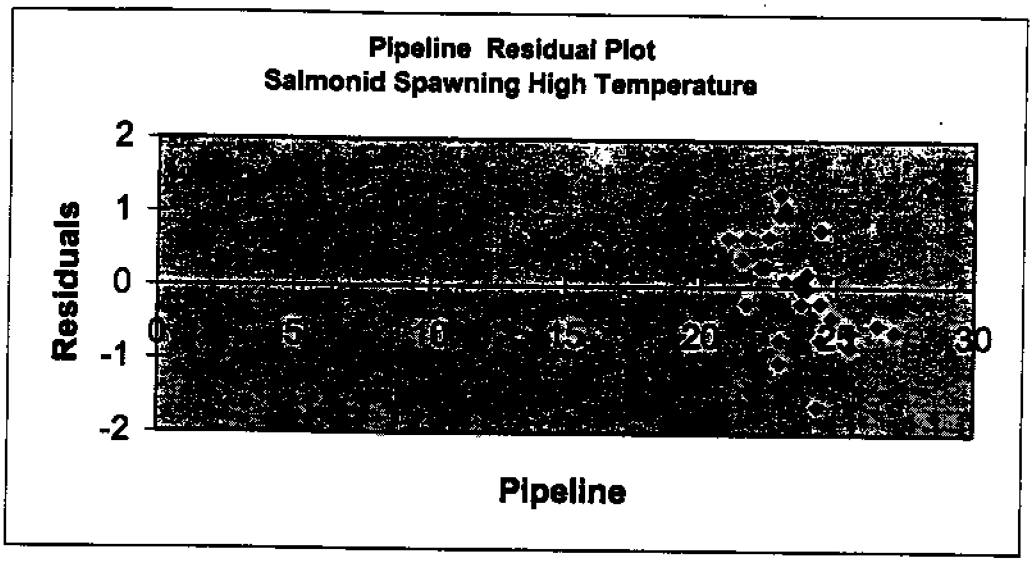
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Pipeline	0.996661648	0.005704352	174.7196357	9.06618E-43	0.984957293	1.008366002	0.984957293	1.008366002

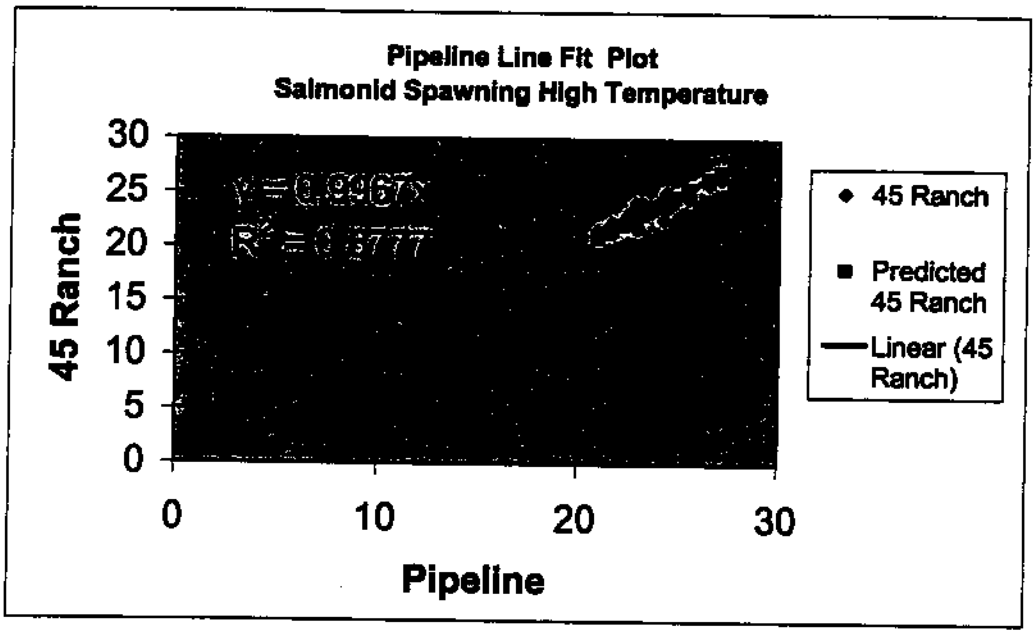
RESIDUAL OUTPUT

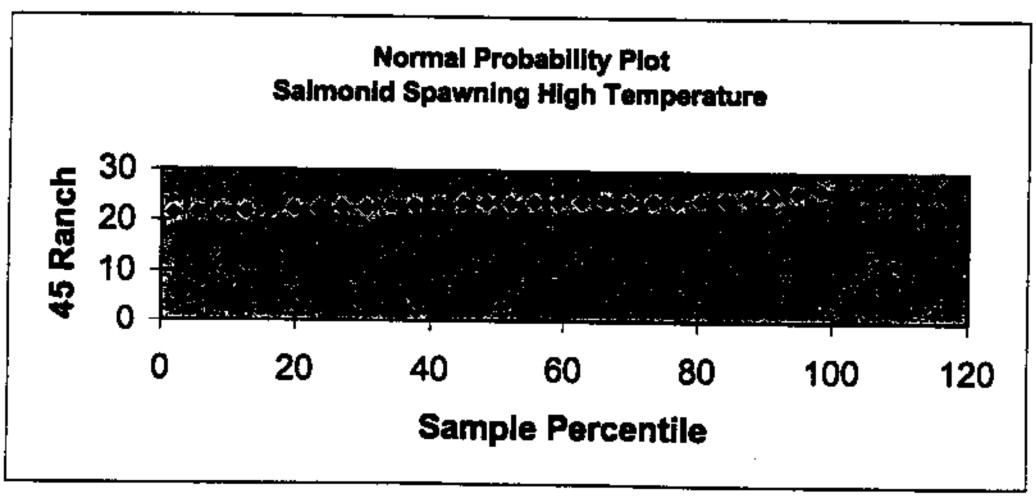
Observation	*Predicted 45 Ranch*	*Residuals*	*Standard Residuals*
1	22.82355173	1.27644827	1.824419372
2	23.62088105	-0.020881048	-0.029845149
3	22.82355173	0.97644827	1.395631285
4	23.02288406	1.07711594	1.539514945
5	23.12255022	0.977449776	1.397062731
6	21.42822542	0.371774577	0.531375031
7	22.12588858	0.274111423	0.391785709
8	23.02288406	0.07711594	0.110221322
9	22.42488707	0.675112929	0.964934604
10	21.62755775	0.672442247	0.961117415
11	20.9298946	0.6701054	0.957777375
12	21.62755775	-0.227557753	-0.325246845
13	22.32522091	0.274779094	0.392740006
14	23.62088105	-0.220881048	-0.315703873
15	23.82021338	-0.020213378	-0.028890852
16	23.82021338	0.179786622	0.256967873
17	23.52121488	0.078785117	0.112607065
18	22.82355173	-0.72355173	-1.034167873
19	22.82355173	-1.02355173	-1.46295596
20	24.21887804	-1.618878037	-2.313852054
21	25.41487201	-0.814872014	-1.164691373
22	24.71720886	-0.41720886	-0.596313964
23	24.3185442	-0.718544201	-1.027010645
24	25.41487201	-0.614872014	-0.878832646
25	26.41153366	-0.511533661	-0.7311318
26	27.00953065	-0.60953065	-0.871198271
27	24.3185442	0.781455799	1.116929789
28	24.3185442	-0.218544201	-0.312363833

PROBABILITY OUTPUT

Percentile	*45 Ranch*
1.785714286	21.4
5.357142857	21.6
8.928571429	21.8
12.5	21.8
16.07142857	22.1
19.64285714	22.3
23.21428571	22.4
26.78571429	22.6
30.35714286	22.6
33.92857143	23.1
37.5	23.1
41.07142857	23.4
44.64285714	23.6
48.21428571	23.6
51.78571429	23.6
55.35714286	23.8
58.92857143	23.8
62.5	24
66.07142857	24.1
69.64285714	24.1
73.21428571	24.1
76.78571429	24.1
80.35714286	24.3
83.92857143	24.6
87.5	24.8
91.07142857	25.1
94.64285714	25.9
98.21428571	26.4


Pipeline Residual Plot
Salmonid Spawning High Temperature
Residuals
2
1
0
-1
-2
0
5
10
15
20
25
30
Pipeline


Pipeline Line Fit Plot
Salmonid Spawning High Temperature
y = 0.9967x
45 Ranch
30
25
20
15
10
5
0
0
10
20
30
Pipeline
45 Ranch
Predicted 45 Ranch
Linear (45 Ranch)


Normal Probability Plot
Salmonid Spawning High Temperature
45 Ranch
30
20
10
0
0
20
40
60
80
100
120
Sample Percentile

Average Temperature Regression Output, June 17 through July 15, 1999

Average Temperatures

Date	Pipeline	45 Ranch
17-Jun-99	21.11	21.94
18-Jun-99	21.79	22.27
19-Jun-99	21.03	21.93
20-Jun-99	21.13	22.15
21-Jun-99	21.48	22.09
22-Jun-99	19.91	20.28
23-Jun-99	20.08	20.55
24-Jun-99	21.17	21.48
25-Jun-99	20.35	20.73
26-Jun-99	19.05	19.88
27-Jun-99	18.57	19.39
28-Jun-99	18.86	19.37
29-Jun-99	19.85	20.56
30-Jun-99	20.81	21.47
01-Jul-99	20.62	21.35
02-Jul-99	20.36	21.22
03-Jul-99	19.69	20.41
04-Jul-99	19.25	19.69
05-Jul-99	18.97	18.97
06-Jul-99	20.11	20.32
07-Jul-99	21.96	22.33
08-Jul-99	20	20.73
09-Jul-99	20.13	20.89
10-Jul-99	21.09	22.02
11-Jul-99	22.33	23.05
12-Jul-99	23.05	23.6
14-Jul-99	22.11	23.41
15-Jul-99	20.31	21
16-Jul-99	20.37	21.53
17-Jul-99	19.94	21.57
18-Jul-99	19.57	21.03
19-Jul-99	19.97	21.52
20-Jul-99	20.42	22.05
21-Jul-99	20.74	21.46
22-Jul-99	20.81	21.88
23-Jul-99	21.09	22.61
24-Jul-99	20.21	21.87
25-Jul-99	20.76	21.62
26-Jul-99	21.57	22.91
27-Jul-99	21.81	23.89
28-Jul-99	20.66	23.86
29-Jul-99	20.77	22.81
30-Jul-99	20.95	22.87
31-Jul-99	20.89	22.15
01-Aug-99	20.96	22.37
02-Aug-99	21.63	22.99
03-Aug-99	21.16	22.91
04-Aug-99	20.44	21.99
05-Aug-99	19.64	21.52
06-Aug-99	18.35	20.19
07-Aug-99	18.03	19.61
08-Aug-99	18.11	19.37
09-Aug-99	19.76	20.81
10-Aug-99	18.09	19.96
11-Aug-99	16.36	17.69
12-Aug-99	17.39	18.44
13-Aug-99	18.63	19.83
14-Aug-99	18.3	19.56
15-Aug-99	18.64	19.65
16-Aug-99	20.19	21.42
19-Aug-99	20.21	21.53
20-Aug-99	20.26	22.58
21-Aug-99	20.4	22.07
22-Aug-99	21.11	21.96
23-Aug-99	20.95	22.81
24-Aug-99	20.46	22.21
25-Aug-99	20.17	21.57
26-Aug-99	20.81	22.26
27-Aug-99	19.25	21.37
28-Aug-99	18.61	20.18
29-Aug-99	19.18	20.87
30-Aug-99	18.07	20.25
31-Aug-99	15.05	18.49
01-Sep-99	13.78	16.47
02-Sep-99	14.16	16.08
03-Sep-99	14.59	16.03
04-Sep-99	14.66	15.67
05-Sep-99	15.56	17.06
06-Sep-99	15.62	16.14
07-Sep-99	15.43	17.33
08-Sep-99	15.83	17.4
09-Sep-99	16.6	18.07
10-Sep-99	16.01	17.93
11-Sep-99	15.86	17.63
12-Sep-99	15.16	16.7
13-Sep-99	15.51	17.05
14-Sep-99	16.12	17.53
15-Sep-99	16.01	17.73
16-Sep-99	15.95	17.99
17-Sep-99	15.74	17.93
18-Sep-99	16.33	18.2
19-Sep-99	16.34	18.39
20-Sep-99	16.14	17.69

SUMMARY OUTPUT

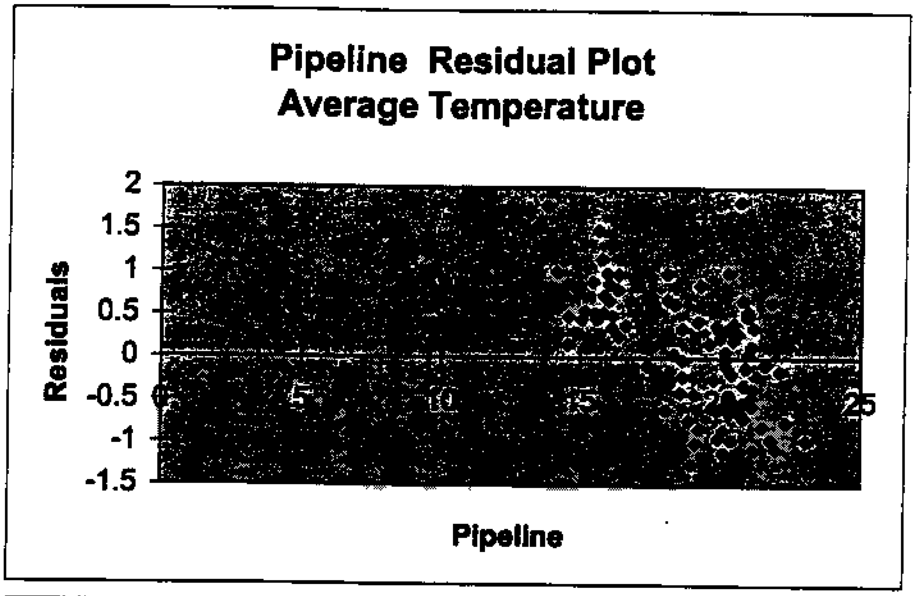
Average Temperature

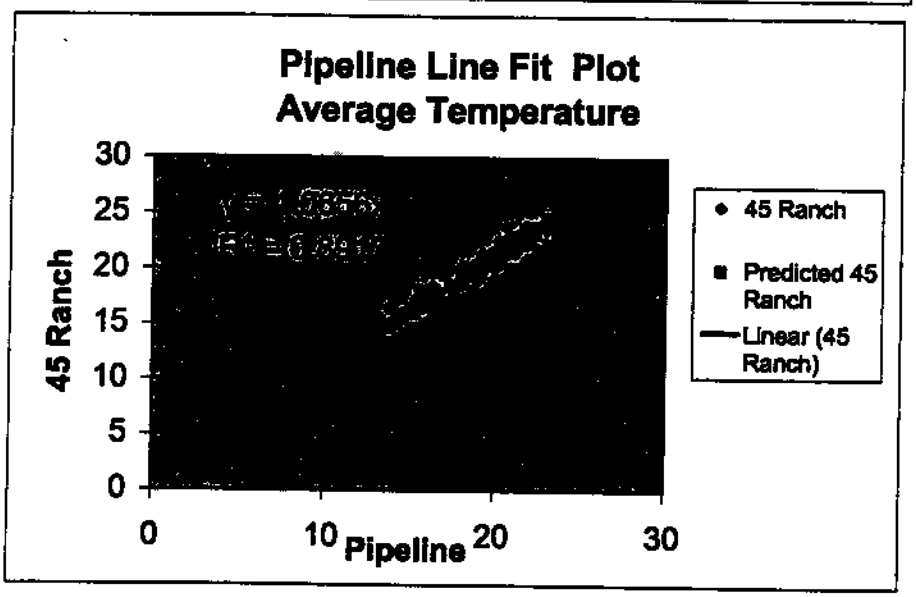
Regression Statistics	
Multiple R	0.944272708
R Square	0.891650946
Adjusted R Square	0.880781381
Standard Error	0.685766448
Observations	93

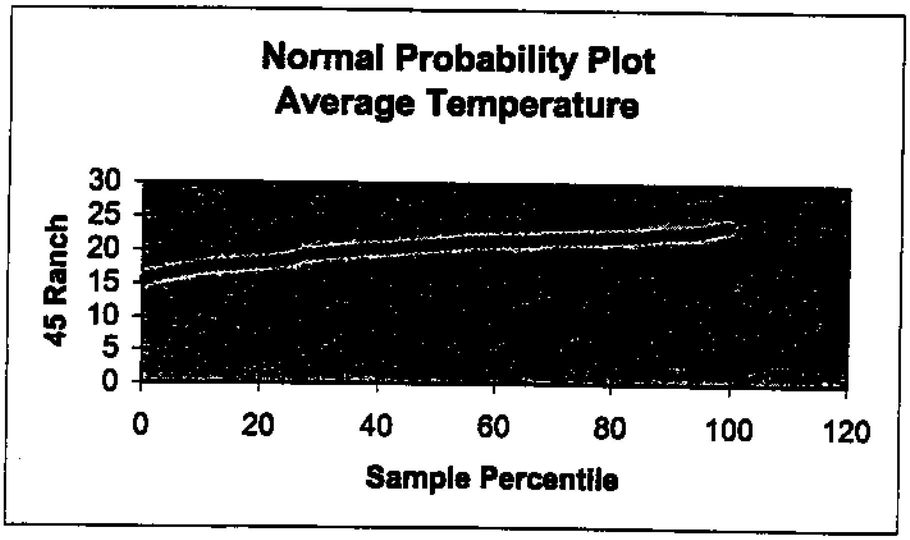
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	356.049226	356.0492	757.108	6.87352E-46
Residual	92	43.2653571	0.470276		
Total	93	399.314583			

	Coefficients	*Standard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Pipeline	1.065640938	0.00369399	288.4793	8E-138	1.058304347	1.072977529	1.058304347	1.072977529


Pipeline Residual Plot
Average Temperature
Residuals
2
1.5
1
0.5
0
-0.5
-1
-1.5
25
Pipeline


Pipeline Line Fit Plot
Average Temperature
45 Ranch
30
25
20
15
10
5
0
0
10
20
30
Pipeline
45 Ranch
Predicted 45 Ranch
Linear (45 Ranch)


Normal Probability Plot
Average Temperature
45 Ranch
30
25
20
15
10
5
0
0
20
40
60
80
100
120
Sample Percentile

High Temperature Regression Output, June 17 through September 20, 1999

Date	Pipeline High Temp	46 Ranch High Temp
17-Jun-99	22.9	24.1
18-Jun-99	23.7	23.6
19-Jun-99	22.9	23.8
20-Jun-99	23.1	24.1
21-Jun-99	23.2	24.1
22-Jun-99	21.5	21.8
23-Jun-99	22.2	22.4
24-Jun-99	23.1	23.1
25-Jun-99	22.5	23.1
26-Jun-99	21.7	22.3
27-Jun-99	21	21.6
28-Jun-99	21.7	21.4
29-Jun-99	22.4	22.6
30-Jun-99	23.7	23.4
01-Jul-99	23.9	23.8
02-Jul-99	23.9	24
03-Jul-99	23.6	23.6
04-Jul-99	22.9	22.1
05-Jul-99	22.9	21.8
06-Jul-99	24.3	22.6
07-Jul-99	25.5	24.6
08-Jul-99	24.8	24.3
09-Jul-99	24.4	23.6
10-Jul-99	25.5	24.8
11-Jul-99	26.5	26.9
12-Jul-99	27.1	26.4
14-Jul-99	24.4	25.1
15-Jul-99	24.4	24.1
16-Jul-99	24.1	24.4
17-Jul-99	23.2	24.2
18-Jul-99	23.7	24.1
19-Jul-99	23.9	24.2
20-Jul-99	24.4	24.6
21-Jul-99	26.3	24.6
22-Jul-99	26	25.3
23-Jul-99	26.2	26.1
24-Jul-99	24.4	24.1
25-Jul-99	26.5	25.6
26-Jul-99	26.7	26.5
27-Jul-99	27	27
28-Jul-99	24.1	26
29-Jul-99	25.1	25.8
30-Jul-99	25.3	25.6
31-Jul-99	24.8	24.2
01-Aug-99	24.4	25.1
02-Aug-99	25.6	24.8
03-Aug-99	23.7	24.2
04-Aug-99	23.7	23
05-Aug-99	22.6	22.5
06-Aug-99	20.2	22
07-Aug-99	21.9	20
08-Aug-99	23.6	21.4
09-Aug-99	22.9	21.9
10-Aug-99	19.8	21.5
11-Aug-99	17.2	19.1
12-Aug-99	20.4	20.7
13-Aug-99	21.9	21.9
14-Aug-99	21.9	21.9
15-Aug-99	23.1	22.4
16-Aug-99	20.95	23
19-Aug-99	24.4	24.7
20-Aug-99	23.63	26.2
21-Aug-99	24.01	24.2
22-Aug-99	26.17	24.5
23-Aug-99	24.4	24.7
24-Aug-99	24.4	24.2
25-Aug-99	24.79	24.2
26-Aug-99	26.17	24.7
27-Aug-99	21.33	23.1
28-Aug-99	21.33	22.5
29-Aug-99	23.24	23.5
30-Aug-99	21.71	22.3
31-Aug-99	19.42	19.2
01-Sep-99	16.62	18
02-Sep-99	17.52	18
03-Sep-99	18.66	18.2
04-Sep-99	19.81	18.2
05-Sep-99	20.96	19.5
06-Sep-99	20.95	20.8
07-Sep-99	20.95	19.6
08-Sep-99	21.71	20.3
09-Sep-99	21.33	20.3
10-Sep-99	19.81	20
11-Sep-99	20.95	20.3
12-Sep-99	20.57	19.3
13-Sep-99	20.57	20.2
14-Sep-99	21.33	20.5
15-Sep-99	20.57	20.6
16-Sep-99	20.19	20.5
17-Sep-99	20.57	20.3
18-Sep-99	21.33	21.1
19-Sep-99	20.95	21.3
20-Sep-99	21.33	20.6

SUMMARY OUTPUT

High Temperatures; $5 Ranch and El Paso Pipeline

Regression Statistics	
Multiple R	0.908444927
R Square	0.825272185
Adjusted R Square	0.81440262
Standard Error	0.904271518
Observations	93

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	355.3209	355.3208504	434.533	2.045E-36
Residual	92	75.22904	0.817706979		
Total	93	430.5499			

	Coefficients	*tandard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Pipeline	0.997837475	0.004089	244.0551216	4E-131	0.9897172	1.0059577	0.9897172	1.005957736

RESIDUAL OUTPUT

Observation	edicted 45 Ran	Residuals	andard Residuals
1	22.85047818	1.249822	1.38962686
2	23.64874816	-0.048748	-0.054200954
3	22.85047818	0.949522	1.055731933
4	23.05004567	1.049954	1.167398459
5	23.14982942	0.950171	1.056453259
6	21.45350571	0.346494	0.385251897
7	22.15199196	0.248008	0.275749347
8	23.05004567	0.049954	0.055542038
9	22.45134319	0.648657	0.72121324
10	21.65307321	0.646927	0.719289706
11	20.95458698	0.645413	0.717606614
12	21.65307321	-0.253073	-0.281381072
13	22.35166944	0.248441	0.27623023
14	23.64874816	-0.248748	-0.276572238
15	23.84831565	-0.048316	-0.05372007
16	23.84831565	0.151684	0.168651214
17	23.54896441	0.051036	0.056744247
18	22.85047818	-0.750478	-0.834423982
19	22.85047818	-1.050478	-1.167980908
20	24.24745084	-1.647451	-1.831728577
21	25.44485561	-0.844856	-0.939358139
22	24.74636938	-0.446369	-0.496298663
23	24.34723439	-0.747234	-0.830817358
24	25.44485561	-0.644856	-0.716989855
25	26.44268309	-0.542683	-0.603386796
26	27.04139557	-0.641396	-0.713139788
27	24.34723439	0.752766	0.836967275
28	24.34723439	-0.247234	-0.274889146
29	24.04788315	0.352117	0.391503381
30	23.14982942	1.050171	1.167638901
31	23.64874816	0.451252	0.501727257
32	23.84831565	0.351684	0.391022498
33	24.34723439	0.252766	0.281039066
34	25.24528812	-0.645288	-0.717467739
35	25.94377435	-0.643774	-0.715784647
36	26.14334185	-0.043342	-0.048189911
37	24.34723439	-0.247234	-0.274889146
38	26.44268309	-0.942683	-1.048139364
39	26.64226058	-0.142261	-0.158173344
40	26.94161193	0.058388	0.064919265
41	24.04788315	1.952117	2.170473685
42	25.04572082	0.754279	0.838650367
43	25.24528812	0.354712	0.394389862
44	24.74636938	-0.546369	-0.607484305
45	24.34723439	0.752766	0.836967275
46	25.54483936	-0.744838	-0.827932056
47	23.64874816	0.551252	0.612912899
48	23.64874816	-0.648748	-0.721314806
49	22.55112694	-0.051127	-0.056846813
50	20.156317	1.843683	2.049910786
51	21.6526407	-1.852641	-2.059870462
52	23.54896441	-2.148964	-2.389339879
53	22.85047818	-0.950478	-1.056796286
54	19.76716201	1.742818	1.937763377
55	17.16280457	1.937195	2.153882178
56	20.35588449	0.344116	0.382607038
57	21.6526407	0.047359	0.052656737
58	21.6526407	0.047359	0.052656737
59	23.05004567	-0.650046	-0.722757457
60	20.9046951	2.095305	2.329678204
61	24.34723439	0.352766	0.392224707
62	23.57889954	1.6211	1.80243098
63	23.95807779	0.241922	0.268982778
64	25.11558925	-0.615589	-0.68442462
65	24.34723439	0.352766	0.392224707
66	24.34723439	-0.147234	-0.163703504
67	24.73639101	-0.536391	-0.596389785
68	25.11558925	-0.415589	-0.462073339
69	21.28387334	1.816127	2.019272084
70	21.28387334	1.216127	1.352158232
71	23.18974292	0.310257	0.344961326
72	21.66306158	0.636948	0.708195188
73	18.37800877	-0.178004	-0.19791483
74	15.58622136	2.413779	2.683776279
75	17.48211256	0.517887	0.575818472
76	18.61964728	-0.419647	-0.466587528
77	19.76716038	-1.56716	-1.742457332
78	20.9046951	-1.404695	-1.561819269
79	20.9046951	-0.104695	-0.116405922
80	20.9046951	-1.104695	-1.228262343
81	21.66306158	-1.363062	-1.515517665
82	21.28387334	-0.983873	-1.093925894
83	19.76716038	0.23284	0.258884225
84	20.9046951	-0.604695	-0.672334133
85	20.52551688	-1.225517	-1.362598792
86	20.52551688	-0.325517	-0.361928013
87	21.28387334	-0.783873	-0.87155481
88	20.52551688	0.074483	0.082814506
89	20.14633862	0.353661	0.393220674
90	20.52551688	-0.225517	-0.250742371
91	21.28387334	-0.183873	-0.204440757
92	20.9046951	0.395305	0.439522288
93	21.28387334	-0.683873	-0.760368968

PROBABILITY OUTPUT

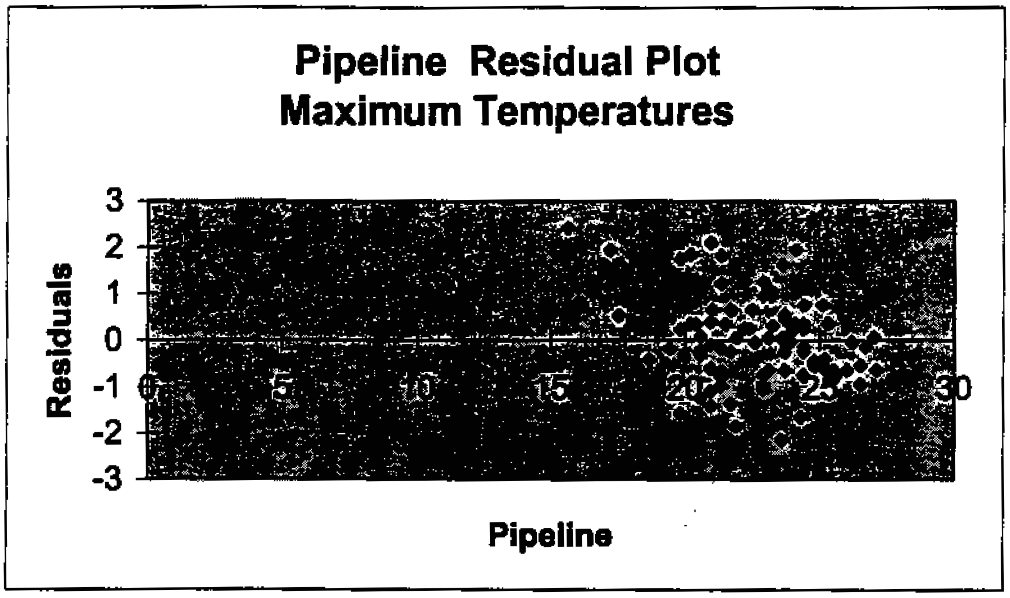
Percentile	45 Ranch
0.5376344	18
1.6129032	18
2.688172	18.2
3.7634409	18.2
4.8387097	19.1
5.9139785	19.2
6.9892473	19.3
8.0645161	19.5
9.1397849	19.8
10.215054	20
11.290323	20
12.365591	20.2
13.44086	20.3
14.516129	20.3
15.591398	20.3
16.666667	20.3
17.741935	20.5
18.817204	20.5
19.892473	20.6
20.967742	20.6
22.043011	20.7
23.11828	20.8
24.193548	21.1
25.268817	21.3
26.344086	21.4
27.419355	21.4
28.494624	21.5
29.569892	21.6
30.645161	21.8
31.72043	21.8
32.795699	21.9
33.870968	21.9
34.946237	21.9
36.021505	22
37.096774	22.1
38.172043	22.3
39.247312	22.3
40.322581	22.4
41.397849	22.4
42.473118	22.5
43.548387	22.5
44.623656	22.6
45.698925	22.6
46.774194	23
47.849462	23
48.924731	23.1
50	23.1
51.075269	23.1
52.150538	23.4
53.225806	23.5
54.301075	23.6
55.376344	23.6
56.451613	23.6
57.526882	23.8
58.602151	23.8
59.677419	24
60.752688	24.1
61.827957	24.1
62.903226	24.1
63.978495	24.1
65.053763	24.1
66.129032	24.1
67.204301	24.2
68.27957	24.2
69.354839	24.2
70.430108	24.2
71.505376	24.2
72.580645	24.2
73.655914	24.2
74.731183	24.3
75.806452	24.4
76.88172	24.5
77.956989	24.6
79.032258	24.6
80.107527	24.6
81.182796	24.7
82.258065	24.7
83.333333	24.7
84.408602	24.8
85.483871	24.8
86.55914	25.1
87.634409	25.1
88.709677	25.2
89.784946	25.3
90.860215	25.5
91.935484	25.6
93.010753	25.8
94.086022	25.9
95.16129	26
96.236559	26.1
97.311828	26.4
98.387097	26.5
99.462366	27

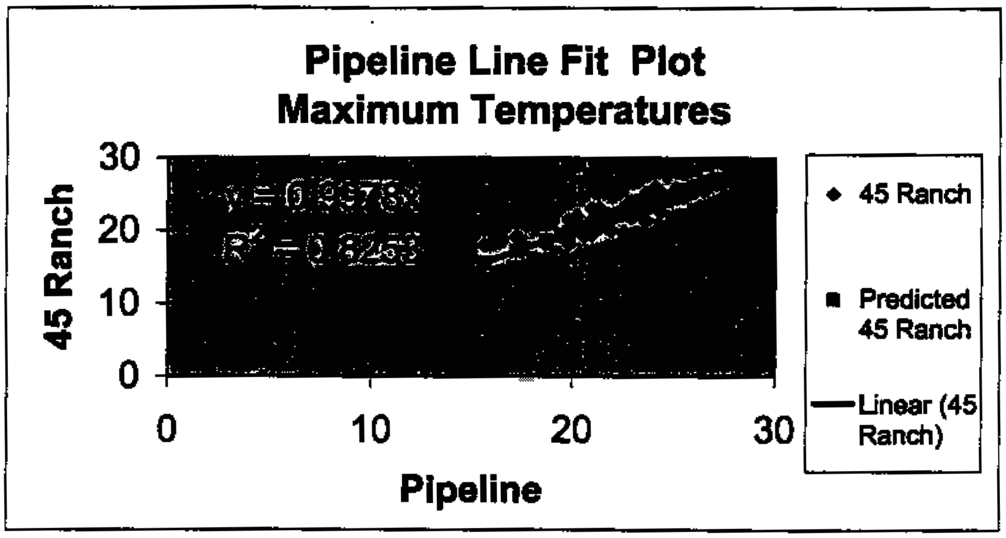
RESIDUAL OUTPUT

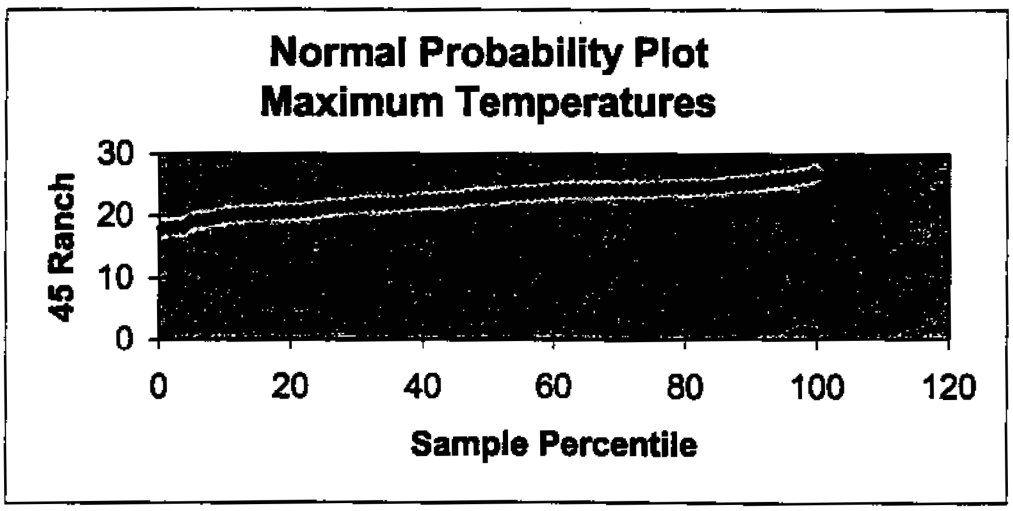
Observation	Predicted 45 Ranch	Residuals	Standard Residuals
1	22.4955802	-0.555680202	-0.8146873
2	23.22031604	-0.95031604	-1.3932832
3	22.41042893	-0.480428927	-0.7043694
4	22.61690302	-0.366893021	-0.5380581
5	22.88996735	-0.799967349	-1.172853
6	21.21691108	-0.936911077	-1.3736298
7	21.39807004	-0.848070036	-1.2433776
8	22.55961866	-1.079618669	-1.5828571
9	21.68579309	-0.955793089	-1.4013132
10	20.30045987	-0.42045987	-0.6164472
11	19.76895222	-0.39895222	-0.5849143
12	20.09796809	-0.727968092	-1.0673223
13	21.15297262	-0.60297262	-0.8840339
14	22.17598792	-0.706987921	-1.0360673
15	21.97351814	-0.623516143	-0.9141533
16	21.6964495	-0.476449490	-0.698536
17	20.96247007	-0.57247007	-0.8393133
18	20.51358808	-0.823588087	-1.207484
19	20.21520659	-1.245208595	-1.8256328
20	21.43003926	-1.110039264	-1.6274575
21	23.39081859	-1.06081859	-1.5552936
22	21.31261876	-0.582618761	-0.8544858
23	21.45135208	-0.561352083	-0.8230129
24	22.47436738	-0.454367383	-0.6661599
25	23.79576215	-0.745762147	-1.0933614
26	24.56302362	-0.963023622	-1.4119141
27	23.66132114	-0.15132114	-0.2218659
28	21.64316745	-0.643167452	-0.9429646
29	21.70710591	-0.177105906	-0.2596596
30	21.2488803	0.321119695	0.47080197
31	20.88459318	0.175406842	0.25716855
32	21.28084983	0.239150467	0.35062474
33	21.76038795	0.289612045	0.42460778
34	22.10139306	-0.651393066	-0.9550244
35	22.17598792	-0.315987921	-0.4632761
36	22.47436738	0.135632617	0.19885452
37	21.53660336	0.333396642	0.48880182
38	22.14401869	-0.524018693	-0.7682778
39	22.96587503	-0.075875034	-0.1112424
40	23.24162886	0.648371141	0.95058386
41	22.01614178	1.83385822	2.68866742
42	22.13336228	0.676637717	0.99203822
43	22.32517765	0.544822348	0.79877827
44	22.2612362	-0.111239196	-0.1630907
45	22.32517765	0.044822348	0.06571521
46	23.04981349	-0.05981349	-0.0876941
47	22.54896225	0.361037751	0.52932687
48	21.78170077	0.208299228	0.30539293
49	21.14231621	0.377683789	0.55373208
50	19.58451121	0.635458787	0.9317087
51	19.21350611	-0.603506113	-0.8848181
52	20.36439633	-0.994396326	-1.4579133
53	21.04640853	-0.236408527	-0.3466047
54	19.27744457	0.682555431	1.00071234
55	17.43388575	0.256114253	0.37549579
56	18.53149591	-0.091495913	-0.1341445
57	19.85229088	-0.022880876	-0.0335806
58	19.50122917	0.048770834	0.07150419
59	19.86354709	-0.213547085	-0.313087
60	21.51529054	-0.095290539	-0.1397079
61	21.53660336	-0.006603358	-0.0096814
62	21.579229	1.000771004	1.4672585
63	21.73907514	0.330924864	0.48517756
64	22.4955802	-0.545580202	-0.800036
65	22.32517765	0.484822348	0.7108107
66	21.80301359	0.406986407	0.5966934
67	21.49397772	0.07602228	0.11145825
68	21.96285973	0.287140267	0.42098364
69	20.61358808	0.856411943	1.25560791
70	19.83157786	0.348422143	0.5108306
71	20.43899319	0.431006808	0.63191033
72	19.25613175	0.993868249	1.45713619
73	18.03789512	0.452103882	0.66284131
74	14.88453213	1.765467874	2.81772107
75	16.07881927	1.001180727	1.4678572
76	15.54770129	0.482298714	0.70711074
77	15.51573208	0.154267942	0.22617626
78	16.60268581	0.447314185	0.65581901
79	16.64531145	1.494688548	2.1914019
80	16.44283987	0.887160326	1.30068892
81	16.86909605	0.530903951	0.77837214
82	17.88963967	0.380380438	0.55768635
83	17.06091142	0.869088582	1.27419346
84	16.90106528	0.728934723	1.06871023
85	16.15611662	0.544883379	0.79886775
86	16.52809095	0.521909051	0.76518449
87	17.17813192	0.351868079	0.51588298
88	17.06091142	0.669088582	0.98096824
89	16.99697298	0.993027038	1.45590287
90	16.77318635	1.156811635	1.69603174
91	17.40191652	0.798083482	1.17009103
92	17.41257293	0.977427072	1.43303135
93	17.19944474	0.49055526	0.71921587

PROBABILITY OUTPUT

Percentile	45 Ranch
0.537634409	15.67
1.612903226	16.03
2.688172043	16.08
3.76344086	16.47
4.838709677	16.49
5.913978495	16.7
6.989247312	17.05
8.064516129	17.05
9.139784946	17.33
10.21505376	17.4
11.29032258	17.53
12.3655914	17.63
13.44086022	17.69
14.51612903	17.69
15.59139785	17.73
16.66666667	17.93
17.74193548	17.93
18.8172043	17.99
19.89247312	18.07
20.96774194	18.14
22.04301075	18.2
23.11827957	18.39
24.19354839	18.44
25.2688172	18.61
26.34408602	18.97
27.41935484	19.37
28.49462366	19.37
29.56989247	19.39
30.64516129	19.55
31.72043011	19.65
32.79569892	19.69
33.87096774	19.83
34.94623656	19.88
36.02150538	19.96
37.09677419	20.18
38.17204301	20.19
39.24731183	20.25
40.32258065	20.28
41.39784946	20.32
42.47311828	20.41
43.5483871	20.56
44.62365591	20.56
45.69892473	20.73
46.77419355	20.73
47.84946237	20.81
48.92473118	20.87
50	20.89
51.07526882	21
52.15053763	21.03
53.22580645	21.22
54.30107527	21.36
55.37634409	21.37
56.4516129	21.42
57.52688172	21.46
58.60215054	21.47
59.67741935	21.48
60.75268817	21.52
61.82795699	21.52
62.90322581	21.53
63.97849462	21.53
65.05376344	21.57
66.12903226	21.57
67.20430108	21.62
68.27956989	21.86
69.35483871	21.87
70.43010753	21.93
71.50537634	21.94
72.58064516	21.95
73.65591398	21.99
74.7311828	22.02
75.80645161	22.06
76.88172043	22.07
77.95698925	22.09
79.03225806	22.15
80.10752688	22.15
81.1827957	22.21
82.25806452	22.25
83.33333333	22.27
84.40860215	22.33
85.48387097	22.37
86.55913978	22.56
87.6344086	22.61
88.70967742	22.81
89.78494624	22.81
90.86021505	22.87
91.93548387	22.91
93.01075269	22.91
94.08602151	22.99
95.16129032	23.05
96.23655914	23.41
97.31182796	23.6
98.38709677	23.85
99.46236559	23.89


Pipeline Residual Plot
Maximum Temperatures
Residuals
3
2
1
0
-1
-2
-3
0
5
10
15
20
30
Pipeline


Pipeline Line Fit Plot
Maximum Temperatures
45 Ranch
30
20
10
0
0
10
20
30
Pipeline
45 Ranch
Predicted 45 Ranch
Linear (45 Ranch)


Normal Probability Plot
Maximum Temperatures
45 Ranch
30
20
10
0
0
20
40
60
80
100
120
Sample Percentile

Average Temperatures

Date	Pipeline	45 Ranch
17-Jun-99	21.11	21.94
18-Jun-99	21.79	22.27
19-Jun-99	21.03	21.93
20-Jun-99	21.13	22.15
21-Jun-99	21.48	22.09
22-Jun-99	19.91	20.28
23-Jun-99	20.08	20.55
24-Jun-99	21.17	21.48
25-Jun-99	20.35	20.73
26-Jun-99	19.05	19.88
27-Jun-99	18.57	19.39
28-Jun-99	18.86	19.37
29-Jun-99	19.85	20.55
30-Jun-99	20.81	21.47
01-Jul-99	20.62	21.35
02-Jul-99	20.36	21.22
03-Jul-99	19.69	20.41
04-Jul-99	19.25	19.69
05-Jul-99	18.97	18.97
06-Jul-99	20.11	20.32
07-Jul-99	21.95	22.33
08-Jul-99	20	20.73
09-Jul-99	20.13	20.89
10-Jul-99	21.09	22.02
11-Jul-99	22.33	23.05
12-Jul-99	23.05	23.6
14-Jul-99	22.11	23.41
15-Jul-99	20.31	21

SUMMARY OUTPUT

Salmonid Spawning Average Temperatures

Regression Statistics	
Multiple R	0.975792697
R Square	0.952171387
Adjusted R Square	0.91513435
Standard Error	0.26414686
Observations	28

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	37.50438164	37.50438164	537.51564	6.80244E-19
Residual	27	1.883886216	0.069773564		
Total	28	39.38826786			

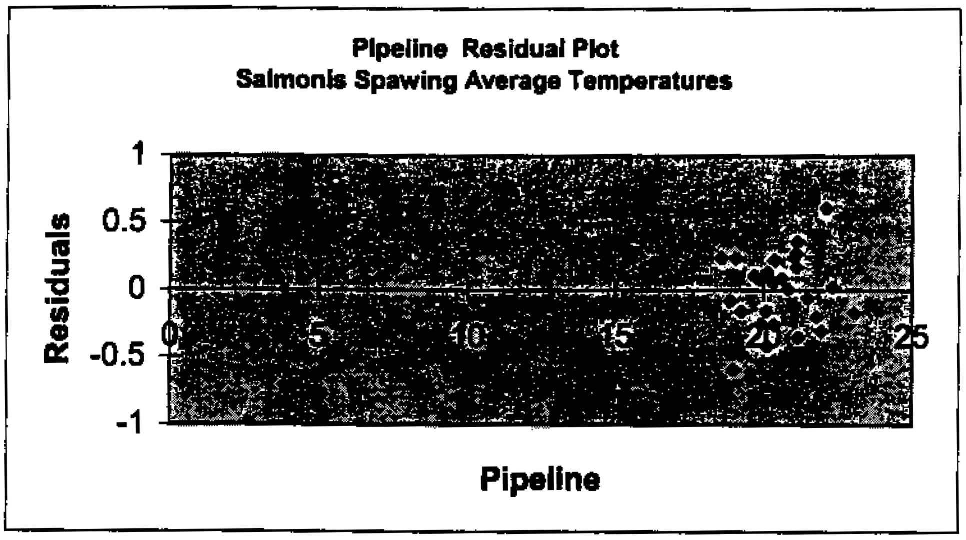
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Pipeline	1.031206731	0.002426705	424.9411923	3.467E-53	1.026227548	1.0361859	1.026227548	1.036185914

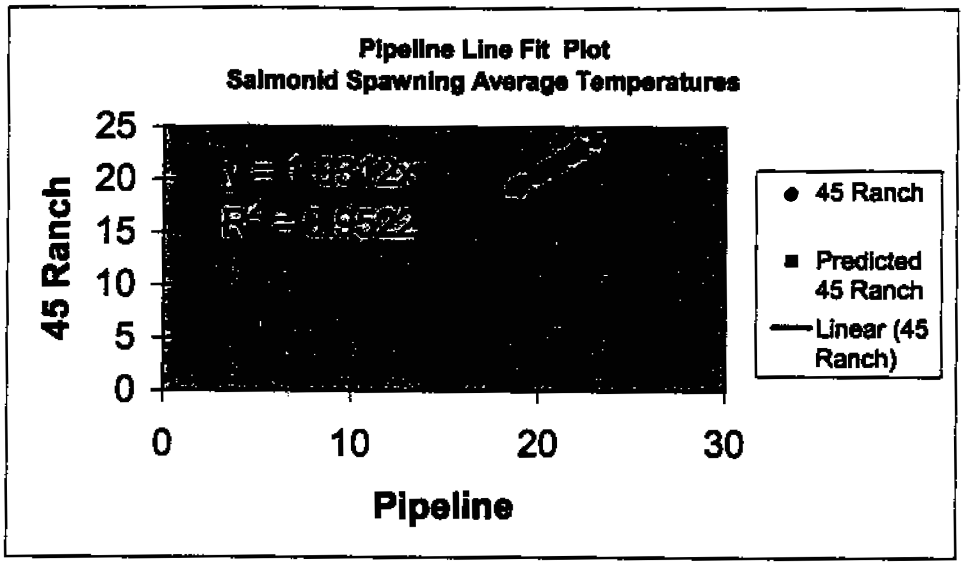
RESIDUAL OUTPUT

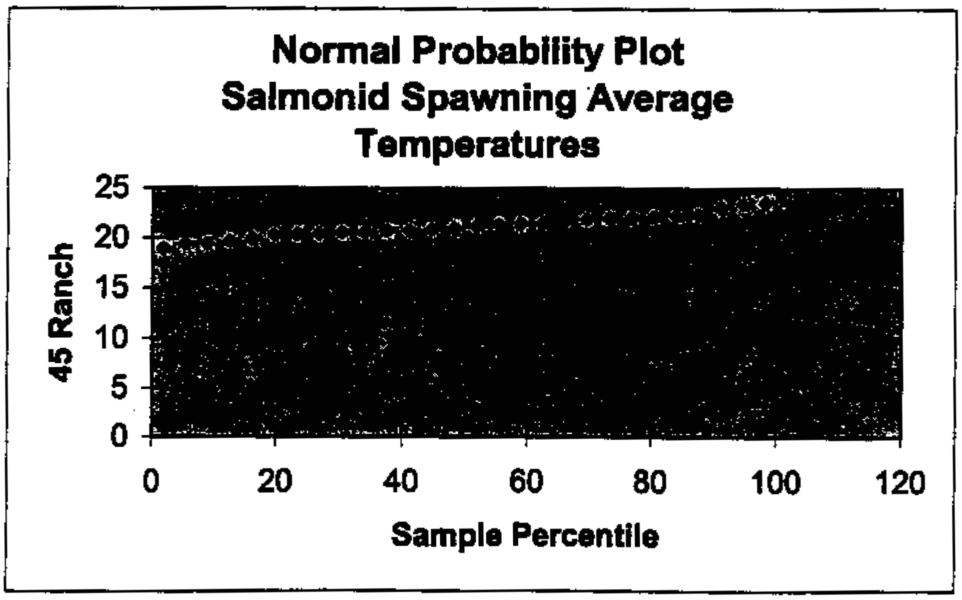
Observation	Predicted 45 Ranch	Residuals	Standard Residuals
1	21.76877409	0.171225915	0.660117394
2	22.46999466	-0.199994662	-0.771027887
3	21.68627755	0.243722453	0.939609117
4	21.78939822	0.36060178	1.390207246
5	22.15032058	-0.060320576	-0.232550437
6	20.53132601	-0.251326008	-0.968922666
7	20.70663115	-0.156631153	-0.60385105
8	21.83064649	-0.350646489	-1.351827187
9	20.98505697	-0.25505697	-0.983306426
10	19.64448822	0.23551178	0.907954983
11	19.14950899	0.240491011	0.927151124
12	19.44855894	-0.078558941	-0.302863755
13	20.4694536	0.080546395	0.310525873
14	21.45941207	0.010587934	0.040819051
15	21.26348279	0.086517213	0.333544821
16	20.99536904	0.224630963	0.866006795
17	20.30446053	0.105539472	0.406880241
18	19.85072957	-0.160729566	-0.619651427
19	19.56199168	-0.591991682	-2.282271388
20	20.73756735	-0.417567355	-1.60982334
21	22.63498774	-0.304987739	-1.175801641
22	20.62413461	0.105865386	0.408136716
23	20.75819149	0.131808511	0.50815375
24	21.74814995	0.271850049	1.048047817
25	23.0268463	0.023153703	0.089263137
26	23.76931514	-0.169315143	-0.652750905
27	22.79998082	0.610019184	2.351771778
28	20.9438087	0.056191299	0.216631075

PROBABILITY OUTPUT

Percentile	45 Ranch
1.785714286	18.97
5.357142857	19.37
8.928571429	19.39
12.5	19.69
16.07142857	19.88
19.64285714	20.28
23.21428571	20.32
26.78571429	20.41
30.35714286	20.55
33.92857143	20.55
37.5	20.73
41.07142857	20.73
44.64285714	20.89
48.21428571	21
51.78571429	21.22
55.35714286	21.35
58.92857143	21.47
62.5	21.48
66.07142857	21.93
69.64285714	21.94
73.21428571	22.02
76.78571429	22.09
80.35714286	22.15
83.92857143	22.27
87.5	22.33
91.07142857	23.05
94.64285714	23.41
98.21428571	23.6


Pipeline Residual Plot
Salmonis Spawing Average Temperatures
Residuals
1
0.5
0
-0.5
-1
0
5
10
15
20
25
Pipeline


Pipeline Line Fit Plot
Salmonid Spawning Average Temperatures
45 Ranch
25
20
15
10
5
0
10
20
30
Pipeline
45 Ranch
Predicted 45 Ranch
Linear (45 Ranch)


Normal Probability Plot
Salmonid Spawning Average Temperatures
45 Ranch
25
20
15
10
5
0
20
40
60
80
100
120
Sample Percentile

Average Temperature Regression Output, June 17 through September 20, 1999

Appendix B. Macroinvertibrate Information

DRAFT: IDEQ IRI SCORE CALCULATION WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ Pipeline
Site ID:	
Date:	13-Jul-99

TCODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL	TEMP TOL	FFG	#Predator	EPT TAXA?	ELMIDAE?	TAXARICH	%PREDDEN
781	11	Acentrella turbida	Ephemeroptera	Baetidae	4	0	CG	0	1	0	1	11
20	93	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5	0	CG	0	1	0	1	93
41	7	Caudatella heterocaudata McDunnough	Ephemeroptera	Ephemerellidae	1	possibly Col	CG	0	1	0	1	7
29	2	Epeorus albertae	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	2
616	31	Ephemerella inermis/infrequens	Ephemeroptera	Ephemerellidae	11	0	CG	0	1	0	1	31
35	5	Rhithrogena	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	5
57	24	Tricorythodes	Ephemeroptera	Tricorythidae	5	0	CG	0	1	0	1	24
1	7	Gomphidae	Odonata	Gomphidae	1	0	PR	7	0	0	1	7
113	1	Hesperoperla pacifica (Banks)	Plecoptera	Perlidae	1	0	PR	1	1	0	1	1
127	7	Isoperla	Plecoptera	Perlodidae	2	0	PR	7	1	0	1	7
235	16	Brachycentrus occidentalis	Trichoptera	Brachycentridae	1	0	CF	0	1	0	1	16
197	1	Cheumatopsyche	Trichoptera	Hydropsychidae	5	0	CF	0	1	0	1	1
593	1	Chimarra	Trichoptera	Philopotamidae	11	0	CF	0	1	0	1	1
238	97	Helicopsyche	Trichoptera	Helicopsychidae	3	0	SC	0	1	0	1	97
198	80	Hydropsyche	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	80
196	2	Hydropsychidae	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	2
182	2	Hydroptila	Trichoptera	Hydroptilidae	6	0	SC	0	1	0	1	2
639	5	Nectopsyche	Trichoptera	Leptoceridae	3	0	UN	0	1	0	1	0
244	6	Oecetis	Trichoptera	Leptoceridae	8	0	PR	6	1	0	1	6
179	30	Protoptila	Trichoptera	Glossosomatidae	1	0	SC	0	1	0	1	30
248	7	Petrophila	Lepidoptera	Pyralidae	5	0	SC	0	0	0	1	7
646	17	Microcylloepus	Coleoptera	Elmidae	4	0	CG	0	0	17	1	17
287	4	Optioservus	Coleoptera	Elmidae	4	0	SC	0	0	4	1	4
674	2	Psephenus	Coleoptera	Psephenidae	4	0	SC	0	0	0	1	2
271	2	Zaitzevia	Coleoptera	Elmidae	4	0	CG	0	0	2	1	2
292	1	Blephariceridae	Diptera	Blephariceridae	0	Cold	SC	0	0	0	1	1
770	1	Ceratopogoninae	Diptera	Ceratopogonidae	6	0	PR	1	0	0	1	1
635	2	Hemerodromia/Chelifera	Diptera	Empididae	6	0	PR	2	0	0	1	2
286	1	Hexatoma	Diptera	Tipulidae	2	0	PR	1	0	0	1	1
303	74	Simulium	Diptera	Simuliidae	6	0	CF	0	0	0	1	74
326	1	Cardiocladius	Diptera	Chironomidae	5	0	PR	1	0	0	1	1
329	1	Cladotanytarsus	Diptera	Chironomidae	7	0	CG	0	0	0	1	1
333	1	Cricotopus	Diptera	Chironomidae	7	0	SH	0	0	0	1	1
349	1	Eukiefferiella devonica	Diptera	Chironomidae	8	0	CG	0	0	0	1	1
357	1	Lopescladius	Diptera	Chironomidae	6	0	CG	1	0	0	1	1
905	1	NEW TAXA ASOF 981101 10	0	0	11	0	UN	0	0	0	0	0
386	2	Polypedilum	Diptera	Chironomidae	6	0	SH	0	0	0	1	2
906	4	NEW TAXA ASOF 981101 10	0	0	11	0	UN	0	0	0	0	0
463	1	Acari	Acari	0	11	0	PR	1	0	0	1	1
417	2	Nematoda	0	0	5	0	PA	0	0	0	1	2
		0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0
	537							27	19	23	38	527

TOTAL IRI		23.000
SITE ID:		
River	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	38.0000
5	EPTRICHNESS	19.0000
5	%DOM	0.1806
5	%ELMIDAE	0.0428
3	%PREDATORS	0.0512

SCORING TABLES

	score	ISU Breakpoints
taxarich		
0.0000	1	<18
18.0000	3	18 - 22
22.0001	5	>22
eptrich	score	
0.0000	1	<9
9.0000	3	9 - 17
17.0001	5	>17
%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.665
0.6651	1	>0.665
%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014
%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

BENTHIC CALCULATION WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ Pipeline
Site ID:	
Date:	23-Aug-99

TCODE	NUMBER	NAME	ORDER	FAMILY	TOL VA		TEMP TOL	FFG	#Predator	EPTTAXA?	ELMIDAE?	TAXARICH	%PREDEM
303	16	Simulium	Diptera	Simuliidae	6		0	CF	0	0	0	1	16
333	2	Cricotopus	Diptera	Chironomidae	7		0	SH	0	0	0	1	2
386	37	Polypedilum	Diptera	Chironomidae	6		0	SH	0	0	0	1	37
848	11	Microcylloepus	Coleoptera	Elmidae	4		0	CG	0	0	11	1	11
271	3	Zaitzevia	Coleoptera	Elmidae	4		0	CG	0	0	3	1	3
287	1	Optioservus	Coleoptera	Elmidae	4		0	SC	0	0	1	1	1
453	1	Acari	Acari		0	11	0	PR	1	0	0	1	1
431	1	Gyraulus	Basommatophora	Planorbidae	8		0	SC	0	0	0	1	1
238	13	Helicopsyche	Trichoptera	Helicopsychidae	3		0	SC	0	1	0	1	13
384	1	Nilotanypus	Diptera	Chironomidae	6		0	PR	1	0	0	1	1
20	88	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5		0	CG	0	1	0	1	88
242	1	Leptoceridae	Trichoptera	Leptoceridae	4		0	CG	0	1	0	1	1
242	1	Leptoceridae	Trichoptera	Leptoceridae	4		0	CG	0	1	0	1	1
368	6	Orthocladius complex	Diptera	Chironomidae	6		0	CG	0	0	0	1	6
180	5	Hydroptilidae	Trichoptera	Hydroptilidae	4		0	UN	0	1	0	1	0
334	5	Cricotopus bicinctus Meigen	Diptera	Chironomidae	7		0	SH	0	0	0	1	5
339	5	Cricotopus trifascia Edwards	Diptera	Chironomidae	7		0	SH	0	0	0	1	5
908	23	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
400	1	Rheotanytarsus	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
384	2	Pentaneura	Diptera	Chironomidae	6		0	PR	2	0	0	1	2
342	2	Dicrotendipes	Diptera	Chironomidae	8		0	CG	0	0	0	1	2
328	6	Cladotanytarsus	Diptera	Chironomidae	7		0	CG	0	0	0	1	6
468	6	Tanytarsus	Diptera	Chironomidae	6		0	CF	0	0	0	1	6
401	1	Rheotanytarsus	Diptera	Chironomidae	6		0	CF	0	0	0	1	1
403	3	Stempellinella	Diptera	Chironomidae	4		0	CG	0	0	0	1	3
1041	16		0	0	0	0	0	0	16	0	0	0	0
1	1	Gomphidae	Odonata	Gomphidae	1		0	PR	1	0	0	1	1
801	16	Acentrella insignificans	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	16
1051	2		0	0	0	0	0	0	2	0	0	0	0
928	6	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
18	1	Baetidae	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	1
28	4	Epeorus albertae	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	4
1055	6		0	0	0	0	0	0	6	0	0	0	0
35	2	Rhithrogena	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	2
672	6	NEW EPT TAXA ASOF 981101 6	Trichoptera		0	11	0	UN	0	1	0	1	0
636	7	Choroterpes	Ephemeroptera	Leptophlebiidae	11		0	CG	0	1	0	1	7
674	1	Psephenus	Coleoptera	Psephenidae	4		0	SC	0	0	0	1	1
6	1	Coenagrionidae	Odonata	Coenagrionidae	9		0	PR	1	0	0	1	1
927	1	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
246	140	Petrophila	Lepidoptera	Pyralidae	5		0	SC	0	0	0	1	140
198	65	Hydropsyche	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	65
1081	5		0	0	0	0	0	0	5	0	0	0	0
635	5	Hemerodromia/Chelifera	Diptera	Empididae	6		0	PR	5	0	0	1	5
583	6	Chimarra	Trichoptera	Philopotamidae	11		0	CF	0	1	0	1	6
173	1	Protoptila	Trichoptera	Glossosomatidae	1		0	SC	0	1	0	1	1
182	5	Hydroptila	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	3
1130	7		0	0	0	0	0	0	7	0	0	0	0
57	25	Tricorythodes	Ephemeroptera	Tricorythidae	5		0	CG	0	1	0	1	25
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
	566								41	18	15	40	315

TOTAL IBI		21.000
SITE ID:		
River:	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	40.0000
3	EPTRICHNESS	18.0000
5	%DOM	0.2381
5	%ELMIDAE	0.0266
3	%PREDATORS	0.0796

SCORING TABLES

taxarich	score	IBU Breakpoints
0.0000	1	<19
19.0000	3	19 - 22
22.0001	5	>22

eptrich	score	
0.0000	1	<8
8.0000	3	8 - 17
17.0001	5	>17

%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.685
0.6851	1	>0.685

%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014

%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

... WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ 45 Ranch
Site ID:	
Date:	13-Jul-99

Sample Collected 98/08/15

T CODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL	TEMP TOL	FFG	#Predator	EPT TAXA?	ELMIDAE?	TAXARICH	%PREDEM
801	11	Acentrella insignificans	Ephemeroptera	Baetidae	4	0	CG	0	1	0	1	11
20	153	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5	0	CG	0	1	0	1	153
28	10	Epeorus albertae	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	10
616	31	Ephemerella infrequens/inermis	Ephemeroptera	Ephemerellidae	11	0	CG	0	1	0	1	31
35	24	Rhithrogena	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	24
57	23	Tricorythodes	Ephemeroptera	Tricorythidae	5	0	CG	0	1	0	1	23
128	1	Skwala	Plecoptera	Perlodidae	2	0	PR	1	1	0	1	1
235	2	Brachycentrus occidentalis	Trichoptera	Brachycentridae	1	0	CF	0	1	0	1	2
197	1	Cheumatopsyche	Trichoptera	Hydropsychidae	5	0	CF	0	1	0	1	1
383	2	Chimarra	Trichoptera	Philopotamidae	11	0	CF	0	1	0	1	2
238	11	Helicopsyche	Trichoptera	Helicopsychidae	3	0	SC	0	1	0	1	11
196	35	Hydropsyche	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	35
198	3	Hydropsychidae	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	3
182	12	Hydroptila	Trichoptera	Hydroptilidae	6	0	SC	0	1	0	1	12
639	1	Nectopsyche	Trichoptera	Leptoceridae	3	0	UN	0	1	0	1	0
244	10	Oecetis	Trichoptera	Leptoceridae	8	0	PR	10	1	0	1	10
179	7	Protoptila	Trichoptera	Glossosomatidae	1	0	SC	0	1	0	1	7
248	6	Petrophila	Lepidoptera	Pyralidae	5	0	SC	0	0	0	1	6
846	7	Microcylloepus	Coleoptera	Elmidae	4	0	CG	0	0	7	1	7
267	2	Optioservus	Coleoptera.	Elmidae	4	0	SC	0	0	2	1	2
674	9	Psephenus	Coleoptera	Psephenidae	4	0	SC	0	0	0	1	9
292	2	Blephariceridae	Diptera	Blephariceridae	0	Cold	SC	0	0	0	1	2
635	4	Hemerodromia/Chelifera	Diptera	Empididae	6	0	PR	4	0	0	1	4
303	38	Simulium	Diptera	Simuliidae	6	0	CF	0	0	0	1	38
946	1	NEW TAXA ASOF 981101 10		0	0 11	0	UN	0	0	0	0	0
329	3	Cladotanytarsus	Diptera	Chironomidae	7	0	CG	0	0	0	1	3
330	1	Conchapelopia	Diptera	Chironomidae	6	0	PR	1	0	0	1	1
339	3	Cricotopus trifascia Panzer	Diptera	Chironomidae	7	0	SH	0	0	0	1	3
346	2	Eukiefferiella brehmi	Diptera	Chironomidae	8	0	CG	0	0	0	1	2
348	1	Eukiefferiella devonica	Diptera	Chironomidae	8	0	CG	0	0	0	1	1
357	20	Lopescladius	Diptera	Chironomidae	6	0	CG	0	0	0	1	20
366	1	Orthocladius complex	Diptera	Chironomidae	6	0	CG	0	0	0	1	1
386	4	Polypedilum	Diptera	Chironomidae	6	0	SH	0	0	0	1	4
387	1	Pseudochironomus	Diptera	Chironomidae	5	0	CG	0	0	0	1	1
988	18	NEW TAXA ASOF 981101 10		0	0 11	0	UN	0	0	0	0	0
429	1	Ferrissia	Basommatophora	Ancylidae	8	0	SC	0	0	0	1	1
437	8	Fluminicola	Mesogastropoda	Hydrobiidae	5	0	SC	0	0	0	1	8
738	1	Valvata	Gastropoda	Valvatidae	8	0	SC	0	0	0	1	1
453	1	Acari	Acari		0 11	0	PR	1	0	0	1	1
			0	0	0 0	0	0	0	0	0	0	0
			0	0	0 0	0	0	0	0	0	0	0
			0	0	0 0	0	0	0	0	0	0	0
	471							17	17	9	37	461

TOTAL IRI	19.000	
SITE ID:		
River	SF Owyhee River @ 45 Ranch	
Unitless Score	METRICS	Raw Score
5	TAXARICH	37.0000
3	EPTRICHNESS	17.0000
5	%DOM	0.3248
5	%ELMIDAE	0.0191
1	%PREDATORS	0.0377

SCORING TABLES

	score	ISU Breakpoints
taxarich		
0.0000	1	<19
19.0000	3	19 - 22
22.0001	5	>22
eptrich	score	
0.0000	1	<9
9.0000	3	9 - 17
17.0001	5	>17
%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.665
0.6651	1	>0.665
%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014
%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

DRAFT: IDEQ IRI SCORE CALCULATION WORKSHEET Version 1

INPUT	
River:	SF Owyhee River @ 45 Ranch
Site ID:	
Date:	24-Aug-98

T CODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL		TEMP TOL	FFG	#Predator	EPTTAXA?	ELMIDAE?	TAXARICH	%PRED[illegible]
482	6	Stempellinella	Diptera	Chironomidae	4		0	CG	0	0	0	1	6
463	4	Acari	Acari		0 11		0	PR	4	0	0	1	4
908	7	NEW TAXA ASOF 981101 18		0	0	11	0	UN	0	0	0	0	0
389	33	Polypedilum	Diptera	Chironomidae	8		0	SH	0	0	0	1	33
417	2	Nematoda		0	0 5		0	PA	0	0	0	1	2
401	2	Rheotanytarsus	Diptera	Chironomidae	6		0	CF	0	0	0	1	2
400	1	Rheosmittia	Diptera	Chironomidae	4		0	CG	0	0	0	1	1
369	13	Orthocladius	Diptera	Chironomidae	6		0	CG	0	0	0	1	13
377	1	Parametriocnemus	Diptera	Chironomidae	5		0	CG	0	0	0	1	1
329	6	Cladotanytarsus	Diptera	Chironomidae	7		0	CG	0	0	0	1	6
1103	1		0	0	0	0	0	0	1	0	0	0	0
1041	1		0	0	0	0	0	0	1	0	0	0	0
357	2	Lopescladius	Diptera	Chironomidae	8		0	CG	0	0	0	1	2
339	11	Cricotopus trifascia Panzer	Diptera	Chironomidae	7		0	SH	0	0	0	1	11
334	2	Cricotopus bicinctus Meigen	Diptera	Chironomidae	7		0	SH	0	0	0	1	2
333	3	Cricotopus	Diptera	Chironomidae	7		0	SH	0	0	0	1	3
368	1	Orthocladius complex	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
384	2	Pentaneura	Diptera	Chironomidae	6		0	PR	2	0	0	1	2
332	1	Corynoneura	Diptera	Chironomidae	7		0	CG	0	0	0	1	1
761	1	Acentrella turbida	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	1
170	14	Glossosomatidae	Trichoptera	Glossosomatidae	0		0	SC	0	1	0	1	14
188	42	Hydropsyche	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	42
187	12	Cheumatopsyche	Trichoptera	Hydropsychidae	5		0	CF	0	1	0	1	12
179	3	Protoptila	Trichoptera	Glossosomatidae	1		0	SC	0	1	0	1	3
1081	12		0	0	0	0	0	0	12	0	0	0	0
182	2	Hydroptila	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	2
416	1	Turbellaria		0	0 4		0	PR	1	0	0	1	1
517	3	Leucotrichia	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	3
437	6	Fluminicola	Mesogastropoda	Hydrobiidae	8		0	SC	0	0	0	1	6
234	2	Helicopsyche	Trichoptera	Helicopsychidae	3		0	SC	0	1	0	1	2
248	41	Petrophila	Lepidoptera	Pyralidae	5		0	SC	0	0	0	1	41
640	14	Acentrella	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	14
1082	6		0	0	0	0	0	0	6	0	0	0	0
801	10	Acentrella insignificans	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	10
928	28	NEW TAXA ASOF 981101 18		0	0	11	0	UN	0	0	0	0	0
20	34	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5		0	CG	0	1	0	1	34
24	3	Heptageniidae	Ephemeroptera	Heptageniidae	4		0	SC	0	1	0	1	3
27	2	Epeorus	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	2
35	21	Rhithrogena	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	21
1058	10		0	0	0	0	0	0	10	0	0	0	0
638	8	Choroterpes	Ephemeroptera	Leptophlebiidae	11		0	CG	0	1	0	1	8
57	75	Tricorythodes	Ephemeroptera	Tricorythidae	5		0	CG	0	1	0	1	75
480	1	Odonata	Odonata		0 11		0	PR	1	0	0	1	1
1	3	Gomphidae	Odonata	Gomphidae	1		0	PR	3	0	0	1	3
1051	17		0	0	0	0	0	0	17	0	0	0	0
271	1	Zaitzevia	Coleoptera	Elmidae	4		0	CG	0	0	1	1	1
267	1	Optioservus	Coleoptera	Elmidae	4		0	SC	0	0	1	1	1
674	11	Psephenidae	Coleoptera	Psephenidae	4		0	SC	0	0	0	1	11
311	9	Atherix	Diptera	Athericidae	2		0	PR	9	0	0	1	9
289	2	Hexatoma	Diptera	Tipulidae	2		0	PR	2	0	0	1	2
303	3	Simulium	Diptera	Simuliidae	6		0	CF	0	0	0	1	3
593	7	Chimarra	Trichoptera	Philopotamidae	11		0	CF	0	1	0	1	7
848	6	Microcylloepus	Coleoptera	Elmidae	4		0	CG	0	0	6	1	6
367	1	Sphaeriidae	Pelecypoda	Sphaeriidae	8		0	CF	0	0	0	1	1
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
	529								86	17	8	46	436

TOTAL IRI		21.000
SITE ID:		
River	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	46.0000
3	EPTRICHNESS	17.0000
5	%DOM	0.1418
5	%ELMIDAE	0.0151
3	%PREDATORS	0.1626

SCORING TABLES

[illegible]	score	ISU Breakpoints
0.0000	1	<16
16.0000	3	16 - 22
22.0001	5	>22

[illegible]	score	
0.0000	1	<8
8.0000	3	8 - 17
17.0001	5	>17

%[illegible]	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.686
0.6861	1	>0.686

%[illegible]	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014

%predators	score	
0.0000	1	[illegible]
0.0400	1	<0.040
0.0401	3	>0.040

Appendix C. Periphyton Analysis (Dr. L. Bahls Report)

SUMMARY

Composite periphyton samples were collected from natural substrates at two sites on the **South Fork** of the **Owyhee River** in July and August 1999 and at one site on the **East Fork** in August 1999. The samples were analyzed using standard methods for the rapid bioassessment of stream periphyton.

Samples from all three sites contained evidence of a bloom of the filamentous green alga *Cladophora* that occurred earlier in the summer when water temperatures were cooler. This bloom and substances released during its breakdown continued to affect periphyton species composition and biological integrity at all sites up to the August sampling dates.

The **El Paso Pipeline** site had low diatom species diversity in July, indicating **moderate impairment and partial support of aquatic life uses**. The probable cause of impairment here was enrichment by inorganic nutrients (phosphorus). The source of phosphorus is unknown and it may be natural (geologic) in origin. The **El Paso Pipeline** site was dominated in July by the diatom *Epithemia sorex*, which is an epiphyte on *Cladophora* and prefers cool waters with a low N:P ratio, indicating that nitrogen was probably the limiting nutrient at this site.

The **45 Ranch** site in July was dominated by the diatom *Cocconeis pediculus*, which is also an epiphyte on *Cladophora*. Dominance by this diatom indicated **minor impairment but full support of aquatic life uses** at this site. Again, the cause of impairment is likely nutrient (phosphorus) enrichment.

In August, diatom associations at both the **El Paso Pipeline** and **45 Ranch** sites indicated **full support of aquatic life uses but with minor impairment**. The cause of impairment at both sites was siltation. Both sites had lower pollution index values than they did in July, indicating an increase in organic loading which may have been generated by decomposition of the preexisting algal mat. This increase was particularly evident at the **45 Ranch**, where there were also signs of warmer water temperatures than those indicated by the July sample.

The **East Fork** in August was dominated by the diatom species *Diatoma vulgare*, which prefers cool water and small diurnal fluctuations in temperature. Dominance by this diatom indicated **minor impairment but full support of aquatic life uses** at this site. The cause of this "impairment" is likely natural and related to the cool and stable temperature regime of the lower **East Fork** above this site. The algal species composition and diatom association metrics indicated that the **East Fork** also experiences some nutrient enrichment, but that it had cooler waters, less siltation and less organic loading than did either site on the **South Fork** in August.

INTRODUCTION

This report evaluates the support of aquatic life uses, and probable causes of impairment to those uses, in the South and East Forks of the Owyhee River in southwestern Idaho and north-central Nevada. This evaluation is based on species composition and community structure of periphyton (benthic algae) communities at two sites on the South Fork and one site on the East Fork of the Owyhee River that were sampled in July and August 1999.

For several reasons, biological surveys are superior to water quality analyses for determining use support (Plafkin et al. 1989): (1) Biological communities measure our success at protecting the *biological integrity*[1] of waterbodies, which is a goal of the federal Clean Water Act; (2) biological communities integrate the effects of different pollutants and provide a holistic measure of their aggregate impact; (3) routine biological monitoring can be relatively inexpensive; (4) the status of biological communities is of direct interest to the public; and (5) biological communities may be the only practical means to evaluate certain types of impacts, such as nutrient enrichment or habitat degradation from non-point sources.

The periphyton or phytobenthos is a diverse assortment of simple photosynthetic organisms, called algae, and other microorganisms that live attached to or in close proximity of the stream bottom. Most algae, such as the diatoms, are microscopic. Diatoms are distinguished by having a cell wall composed of opaline glass--amorphous hydrated silica. Diatoms often carpet a stream bottom with a slippery brown film.

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[1] *Biological integrity* is defined as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats within a region" (Karr and Dudley 1981).

Some algae, such as the filamentous greens, are conspicuous and their luxuriant growth may deplete dissolved oxygen, interfere with fish spawning, clog irrigation intakes, and cause other problems. Collectively, the phytobenthos accounts for much of the primary production and biological diversity of western streams.

Stevenson and Bahls (1999) list several advantages for using periphyton in biological assessments of streams:

- Algae are universally present in large numbers in all streams and unimpaired periphyton assemblages typically support a large number (>30) of species;
- Algae have rapid reproduction rates and short life cycles, making them useful indicators of short-term impacts;
- As primary producers, algae are most directly affected by physical and chemical factors, such as temperature, nutrients, and toxins;
- Sampling is easy and inexpensive, and causes minimal damage to resident biota and their habitat;
- Standard methods and criteria exist for evaluating the composition, structure, and biomass of algal associations;
- Identification to species is straightforward, especially for the diatoms, for which there is a large body of taxonomic and ecological literature; and
- Excess algae in streams is often correctly perceived as a problem by the public.

The federal Clean Water Act directs states to develop pollution control plans (Total Maximum Daily Loads or TMDLs) that set limits on pollution loading to water-quality limited waterbodies. Water-quality limited waterbodies are lakes and stream segments that do not meet water-quality standards, that is, do not fully support their beneficial uses. The Clean Water Act and EPA regulations require each state to (1) identify waters that are water-quality limited, (2) prioritize and target waters for TMDLs, and (3) develop TMDL plans to attain and maintain water-quality standards for all water-quality limited waters.

The underlying purpose of this report is to provide information that will help the State of Idaho determine whether the South and East Forks of the Owyhee River are water-quality limited and in need of TMDLs.

PROJECT AREA AND SAMPLING SITES

The project area is in Owyhee County in southwestern Idaho and Elko County in northeastern Nevada. The East Fork (main) Owyhee River heads at about 10,000 feet elevation in the Humboldt National Forest of northcentral Nevada, and flows northwesterly into Idaho. The South Fork begins in the high desert of northern Nevada and also flows northwesterly into Idaho where it meets the East Fork in the extreme southwestern corner of the state. The Owyhee River then flows into Oregon where it eventually joins the Snake River west of Boise.

Periphyton samples were collected in July and August at two sites on the South Fork, one in Nevada about 7 miles south of the state line and one in Idaho about 15 miles north of the state line (Table 1). One sample was collected in August at a site on the East Fork near its confluence with the South Fork (Table 1). There are no tributaries to the South Fork from about 8 miles upstream of the Nevada site to the confluence with the East Fork, a distance of about 40 miles (Mike Ingham, IDEQ, pers. comm.)

Elevations at these sampling sites range from 4,200 feet to 4,670 feet above mean sea level. All three sites are within the Snake River Basin/High Desert Ecoregion (Omernik 1986). Both rivers run through deep canyons at the sampling sites; the South Fork canyon is oriented south to north and the East Fork canyon is oriented east to west. The bedrock geology is volcanic in origin: basalt and rhyolite (Mike Ingham, IDEQ, pers. comm.).

Land use in the catchments of both the East and South Forks is largely cattle grazing with some hay production. Livestock activity is variable, and has resulted in overutilization of woody species in some riparian areas (Mike Ingham, IDEQ, pers. comm.).

The South Fork in Idaho is on the 303(d) list for sediment and temperature. Water temperatures may approach or exceed 26°C, but diverse age classes of native redband trout have been noted. Large mats of filamentous algae have been observed in the South Fork at the Idaho site; the Nevada site appears to support smaller standing crops of algae (Mike Ingham, IDEQ, pers. comm.).

METHODS

At each site, periphyton samples were composed of material removed from three cobbles collected from three separate riffles. The periphyton was removed using a stiff eraser brush and was composited into a single container where it was preserved with formalin (Mike Ingham, IDEQ, pers. com.). Each sample consisted of about 30 ml of periphyton and river water.

Samples were examined to estimate the relative abundance and rank by biovolume of diatoms and genera of "soft" (non-diatom) algae according to the method described in Bahls (1993). Soft algae were identified using Prescott (1978), Smith (1950), and Whitford and Schumacher (1984).

After the identification of soft algae, raw periphyton samples were "cleaned" of organic matter using sulfuric acid, and permanent diatom slides were prepared in Hyrax following *Standard Methods for the Examination of Water and Wastewater* (APHA 1998). For each slide, between 400 and 450 diatom cells (800 to 900 valves) were counted at random and identified to species using the following taxonomic references: Krammer and Lange-Bertalot 1986, 1988, 1991a, 1991b; Patrick and Reimer 1966, 1975.

The diatom proportional counts were used to generate an array of diatom association metrics (Table 2). A metric is a characteristic of the biota that changes in some predictable way with increased human influence (Barbour et al. 1999).

One additional metric was calculated for this study: percent of cells in the diatom family Epithemiaceae. This family is represented in rivers by two genera--*Epithemia* and *Rhopalodia*--that commonly harbor endosymbiotic nitrogen-fixing bluegreen algae (cyanobacteria) within their cells. A diatom association that contains a large percentage of cells in these genera may indicate nitrogen-limiting conditions, that is, low nitrogen to phosphorus ratios (Stevenson and Pan 1999).

Metric values from Owyhee River study sites were compared to numeric criteria for streams in the Rocky Mountain and Montana Valley and Foothill Prairies Ecoregions of Montana (Omernik and Gallant 1987) (Table 3). These criteria are based on metric values measured in least-impaired reference streams (Bahls et al. 1992) and on metric values measured in streams exhibiting various levels of use support, which are known to be impaired by various sources and causes of pollution (Bahls 1993).

Although periphyton biocriteria are not available for the Snake River Basin/High Desert Ecoregion, comparison of the Owyhee metrics to the Montana criteria for mountain and foothill streams appears to be valid. The Owyhee River is similar in elevation, flow and thermal characteristics to the middle Clark Fork River near Missoula in western Montana. Moreover, the two rivers have very similar summer diatom associations and share many of the same dominant species (see Weber 1999).

The criteria in Table 3 distinguish among four levels of impairment and three levels of aquatic life use support: no impairment or only minor impairment (full support); moderate impairment (partial support); and severe impairment (nonsupport). These impairment levels correspond to excellent, good, fair, and poor *biological integrity*, respectively.

Only periphyton samples collected in summer (June 21-September 21) can be compared with confidence to reference stream samples because metric values change seasonally and summer is the season in which reference streams and impaired streams were sampled for the purpose of biocriteria development.

RESULTS AND DISCUSSION

Results are presented in Tables 4 and 5, located near the end of this report following the Literature Cited section. Completed diatom proportional counts, with species pollution tolerance classes (PTC) according to Lange-Bertalot (1979) and calculated percent abundances, are attached as Appendix A.

SAMPLE OBSERVATIONS

South Fork Owyhee River at El Paso Pipeline (07/13/99). The bulk of this sample was composed of fungal hyphae; it is not known whether these hyphae were present when the sample was collected or whether they grew afterwards due to incomplete preservation. The *Cladophora* in this sample was in poor condition, indicating perhaps that there was a bloom of this algae at this site in the weeks preceding sample collection. The dominant epiphyte on the remains of the *Cladophora* filaments was the diatom *Cocconeis pediculus*. The most abundant algae in the sample was the diatom *Epithemia sorex*.

South Fork Owyhee River at El Paso Pipeline (08/17/99). The bulk of this sample consisted of globs of an amorphous organic floc and what appeared to be individual yeast cells or fungal spores dispersed throughout the sample. The *Cladophora* in this sample was senescent but in better shape than it was in the sample collected in July, perhaps indicating some regrowth after the water began to cool in early August. *Cocconeis pediculus* was again a common epiphyte on the *Cladophora*.

South Fork Owyhee River at 45 Ranch (07/13/99). This sample smelled of hydrogen sulfide, indicating incomplete preservation. The bulk of this sample was composed of amorphous organic floc (remains of decomposed algae?) and one very large senescent colony of the cyanobacterium *Nostoc*. *Cocconeis pediculus* was a common epiphyte on *Cladophora*, which was senescent. The sample was silty and freshwater sponge spicules were present.

South Fork Owyhee River at 45 Ranch (08/18/99). Organic floc and fungal hyphae were present but not abundant. *Cocconeis pediculus* was again an epiphyte on *Cladophora*, which was senescent. The sample was silty.

East Fork Owyhee River at Crutcher's Crossing (08/16/99). *Cladophora* filaments appear quite elderly, whereas *Stigeoclonium* filaments are young and vigorous. Filamentous bacteria are common. Globs of organic floc and fungal hyphae were present but they did not dominate the sample. Endosymbiotic cyanobacteria were observed living in cells of *Epithemia sorex*.

NON-DIATOM (SOFT) ALGAE

July 1999 Samples

Both the **El Paso Pipeline** site and the **45 Ranch** site had relatively diverse assemblages of non-diatom algae in July, with totals of 12 and 8 genera, respectively (Table 4). Diatoms were the most abundant algae at both sites, followed in biovolume rank by cyanobacteria (*Phormidium* and *Nostoc*) and the common branched filamentous green alga *Cladophora*.

The poor condition of the *Cladophora* indicated that it represented the remains of a bloom that occurred earlier in the summer. The presumed earlier bloom of *Cladophora* at these sites and the abundance of nitrogen-fixing cyanobacteria may indicate nutrient enrichment, but also a shortage of nitrogen relative to the supply of phosphorus (low N:P ratio). (Available nutrients may be assimilated quickly by the algal mat, which may account for low ambient nutrient concentrations in the water column.)

August 1999 Samples

Again, the South Fork produced a diverse assemblage of non-diatom algae, with 12 and 10 genera recorded at the **El Paso Pipeline** and the **45 Ranch**, respectively (Table 4). *Cladophora* was the dominant algae at the **El Paso Pipeline** in August, whereas diatoms and the cyanobacterium *Rivularia* dominated the flora at the **45 Ranch.** *Stigeoclonium*, an indicator of organic pollution, appeared for the first time at the **45 Ranch.** *Spirogyra*, which prefers warmer waters, also appeared here for the first time. However, *Audouinella*, a red alga and an indicator of relatively cool and clean waters, also appeared at this site--in August as well as in July.

The **East Fork** had fewer non-diatom genera than did either site on the South Fork (Table 4). Diatoms dominated at this site, followed in abundance by *Stigeoclonium* and *Cladophora*. Nitrogen-fixing cyanobacteria were also common at this site, including *Tolypothrix*, an indicator of cool, clean waters.

DIATOM ALGAE

July 1999 Samples

Several species of pollution sensitive (Class 3) diatoms dominated the flora of the **South Fork Owyhee River** in July 1999 (Table 5). By far the most abundant of these dominants at the **El Paso Pipeline** station was *Epithemia sorex*, which accounted for nearly 70% of all diatom cells at this site.

Epithemia sorex and other species in the diatom family Epithemiaceae are widely known to harbor endophytic, symbiotic, nitrogen-fixing cyanobacteria (Lowe 1987). *E. sorex* is a cosmopolitan, periphytic, alkaliphilous diatom (pH optimum ~8.4) with eutrophic tendencies (Lowe 1974). *E. sorex* is the most abundant and widespread species of Epithemiaceae in Montana streams, where it prefers cool waters (~13.5°C) and a low nitrogen-to-phosphorus ratio (mean = 3.2:1); it is frequently epiphytic on the filamentous green alga *Cladophora* and associated with various free-living genera of cyanobacteria, most of which fix molecular nitrogen (Bahls and Weber 1988).

The very large number of *Epithemia sorex* cells at the **El Paso Pipeline** site resulted in a large Percent Dominant Species value and a small Shannon Species Diversity value for this site, both of which indicate only **partial support of aquatic life uses with moderate impairment** (Table 5). The relatively small number of species counted at this site in July (22) indicated minor impairment. The probable cause of impairment at this site and of the *Cladophora* bloom that preceded the July sampling visit is nutrient (phosphorus) enrichment. The source of this enrichment is unknown, and may be natural (geologic) in origin.

Diatom associations at the **El Paso** and **45 Ranch** sites in July were very dissimilar (Table 5). The dominant diatom at the **45 Ranch** site in July was *Cocconeis pediculus*. This diatom is a common epiphyte on *Cladophora* and its abundance at this site is an artifact of the *Cladophora* bloom that preceded the collection of the periphyton sample. The percent abundance of *Epithemia sorex* was much lower at the **45 Ranch** than it was upstream (Table 5), perhaps because of warmer water temperatures and/or a shift (increase) in the N:P ratio at the Idaho site.

Diatom metrics indicated **full support of aquatic life uses with only minor impairment** at the **45 Ranch** in July (Table 5). The probable cause of impairment at this site and of the *Cladophora* bloom that preceded the July sampling visit is nutrient (phosphorus) enrichment.

Although there were several signs of inorganic nutrient, primarily phosphorus, enrichment at both **South Fork** sites in July, the relatively high Pollution Index values indicated that organic loading was negligible at both sites (Table 5).

August 1999 Samples

The diatom associations at the **El Paso** and **45 Ranch** sites were much more similar in August than they were in July, having almost half of their floras in common (Table 5). Siltation Index values at both sites indicated **full support of aquatic life uses but with minor impairment** caused by siltation.

Dominance by the nitrogen heterotrophic species *Nitzschia palea* probably indicates an increase in organic nitrogen at the **45 Ranch** site in August. This increase was accompanied by a borderline Pollution Index value of 2.53 (values below 2.50 indicate minor impairment). Meanwhile, *Epithemia sorex* was less abundant and Pollution Index values were smaller at both **South Fork** sites in August than they were in July, indicating warming water temperatures, an increase in bioavailable nitrogen, and an increase in organic loading.

The dominant diatom in the **East Fork** Owyhee River in August was *Diatoma vulgare* (Table 5). Dominance by this diatom resulted in a biological integrity rating of "good", indicating **full support of aquatic life uses but with minor impairment**. The cause of this "impairment" is probably the naturally stable thermal regime of the **East Fork**, which favors rapid growth and division of *Diatoma vulgare* cells.

Diatoma vulgare is a current-loving, fall or winter dominant diatom with a temperature optimum of about 15°C (Lowe 1974). Below Hebgen Dam in the Madison River of southwestern Montana, *Diatoma vulgare* dominated the diatom assemblage in August 1998, accounting for 64% of the diatom cells (Bahls 1999). During the two weeks before sampling the Hebgen site, mean daily temperature was very close to the 15°C optimum for this species and diurnal temperature fluctuations were only 2-3°C (Montana Power Company, unpublished data).

The **East Fork** in August had about 44% of its diatom flora in common with the **45 Ranch** site on the South Fork (Table 5). The percent community similarity between the **El Paso** and **East Fork** sites in August was about 36%.

The Pollution Index value for the **East Fork** (2.86) was significantly larger than values at either site on the **South Fork**, indicating less organic loading in the **East Fork** (Table 5). The borderline Pollution Index value of 2.53 indicates minor organic loading at the **45 Ranch** site. This loading may be generated in part by mats of decomposing algae upstream.

RECOMMENDATIONS

1. Subsequent periphyton sampling trips to the forks of the Owyhee River should be scheduled earlier in the summer--late June to early July--in order to catch suspected *Cladophora* blooms.

2. Periphyton sampling in the forks of the Owyhee River should include collection of samples for measurement of algal standing crops using chlorophyll *a* and ash-free dry mass; results of these measurements should be compared to criteria developed by New Zealand (Zuur 1992) and the Province of British Columbia (Nordin 1985) for protection of aquatic life and recreational uses.

3. The State of Idaho should begin to develop periphyton biocriteria for streams in the Snake River Basin/High Desert Ecoregion and for streams in other ecoregions not shared with Montana or with other states that use periphyton biocriteria.

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Table 1. Location of periphyton sampling sites on the South and East Forks of the Owyhee River in Idaho and Nevada, values for selected environmental variables, and dates on which periphyton samples were collected.[1]

Location	Legal Description	Flow (cfs)	Conductance (µmhos/cm)	Sample Date
South Fork Owyhee River at El Paso Pipeline Crossing at road switchback and campsite (Nevada)	T47NR47ES23NW	80+	318	07/13/99
South Fork Owyhee River at El Paso Pipeline Crossing at road switchback (Nevada)	T47NR47ES23NW	20-30	300	08/16/99[2]
South Fork Owyhee River at 45 Ranch above river ford (Idaho)	T14SR05WS26NW	80+	328	07/13/99
South Fork Owyhee River at 45 Ranch at last hayfield (Idaho)	T14SR05WS25SW	"Low"	300	08/18/99
East Fork Owyhee River at Crutcher's Crossing (Idaho)	T13SR05WS25SE	data not available	data not available	08/16/99

[1] Source: Periphyton Data Sheets, 1999 Beneficial Use Reconnaissance Project Field Forms, Idaho Division of Environmental Quality (completed by M. Ingham).

[2] The sample date recorded on the sample container was 08/17/99.

Table 2. Diatom association metrics used to evaluate biological integrity in Montana streams: reference, range of values in Montana streams, and expected direction of metric response to increasing anthropogenic perturbation or natural stress.

Metric	Reference	Range of Values	Expected Response
Shannon Species Diversity	Bahls 1979	0.00-5.00+	Decrease[1]
Pollution Index[2]	Bahls 1993	1.00-3.00	Decrease
Siltation Index[3]	Bahls 1993	0.00-90.0+	Increase
Disturbance Index[4]	Barbour *et al.* 1999	0.00-100.0	Increase
No. Species Counted	Bahls 1979, 1993	0-100+	Decrease[1]
Percent Dominant Species	Barbour *et al.* 1999	5.0-100.0	Increase
Percent Abnormal Cells	McFarland *et al.* 1997	0.0-20.0+	Increase
Similarity Index	Whittaker 1952	0.0-80.0+	Decrease

[1] Shannon diversity and species richness may increase somewhat in naturally nutrient-poor mountain streams in response to slight to moderate increases in nutrients or sediment.

[2] This is a composite numeric expression of the pollution tolerances assigned by Lange-Bertalot (1979) to the common diatom species; responds to **organic** pollution only.

[3] Computed as the sum of the percent abundances of all species in the genera *Navicula*, *Nitzschia*, and *Surirella*. These are common genera of predominantly motile taxa that are able to maintain their positions on the substrate surface in depositional environments.

[4] Computed as the percent abundance of *Achnanthes minutissima*. This attached taxon typically dominates early successional stages of benthic diatom associations and resists chemical, physical and biological disturbances in the form of metals toxicity, substrate scour by high flows and fast currents, and grazing by macroinvertebrates.

Table 4. Estimated relative abundance of algal cells and rank by volume of diatoms and genera of non-diatom algae in periphyton samples collected from the South and East Forks of the Owyhee River in July and August 1999. R = rare, C = common, VC = very common, A = abundant, VA = very abundant.

Taxa	July 1999 Samples		August 1999 Samples		
	El Paso Pipeline	45 Ranch	El Paso Pipeline	45 Ranch	East Fork
Chlorophyta					
Ankistrodesmus	VC(6)	VC(6)	VC(6)	C(10)	
Cladophora	C(3)	C(3)	A(1)	C(4)	VC(3)
Closterium	C(8)			C(6)	
Cosmarium	C(10)	C(8)	C(9)	C(8)	C(5)
Geminella			R(13)		
Mougeotia	C(11)				
Oocystis			C(10)		
Pediastrum			C(11)	R(11)	
Scenedesmus	VC(5)	C(9)	VC(5)	VC(7)	
Spirogyra				C(9)	
Stigeoclonium				VC(3)	A(2)
Chrysophyta					
Diatoms	VA(1)	A(1)	VC(2)	VA(1)	VA(1)
Rhodophyta					
Audouinella		C(5)		C(5)	
Cyanophyta					
Anabaena			C(8)		
Gomphosphaeria	C(13)				
Merismopedia	C(12)				
Nostoc	C(7)	VA(2)	VC(3)		
Oscillatoria	VC(4)		C(7)		
Phormidium	A(2)		C(12)		
Rivularia	C(9)	VC(4)	VC(4)	A(2)	C(4)
Tolypothrix		C(7)			C(6)

Table 5. Percent abundance of major diatom species[1] and values of selected diatom association metrics for periphyton samples collected from the South and East Forks of the Owyhee River in July and August 1999. Underlined values indicate full support of aquatic life uses with minor impairment; **bold values** indicate partial support of aquatic life uses with moderate impairment; **underlined and bold values** indicate nonsupport of aquatic life uses and severe impairment based on criteria for wadeable mountain streams in Table 3. A "p" indicates the diatom was observed as present in the sample but was not encountered during the diatom proportional count.

Species/Metric (Pollution Tolerance Class)	July 1999 Samples El Paso Pipe	July 1999 Samples 45 Ranch	August 1999 Samples El Paso Pipe	August 1999 Samples 45 Ranch	August 1999 Samples East Fork
Achnanthes minutissima (3)	0.75	16.00	9.66	4.93	0.44
Cocconeis pediculus (3)	2.25	40.50	8.05	3.97	1.22
Cocconeis placentula (3)	0.88	7.63	10.80	4.57	11.89
Diatoma vulgare (3)	5.38	0.75	1.03	15.99	34.00
Epithemia sorex (3)	69.63	8.13	8.97	4.69	17.89
Fragilaria construens (3)		1.75	15.40	7.21	1.56
Nitzschia palea (1)	4.25	2.00	1.03	12.50	3.11
Number of Cells Counted	400	400	435	416	450
Shannon Species Diversity	1.93	3.29	4.58	4.53	3.30
Pollution Index	2.85	2.83	2.65	2.53	2.86
Siltation Index	8.38	12.79	25.35	33.77	13.20
Disturbance Index	0.73	16.00	9.66	4.93	0.44
Number of Species Counted	22	46	61	58	37
Percent Dominant Species	69.63	40.50	15.40	15.99	34.00
Percent Abnormal Cells	0.00	0.00	0.00	0.00	0.00
Percent Epithemiaceae	69.63	8.38	10.80	4.69	18.44
Similarity Index	17.90		49.04	43.74	

[1] A major diatom species is here defined as one that accounts for 10.0 percent or more of the diatom cells that were counted at one or more stations in a sample set.

Note: The similarity index between the El Paso and East Fork stations in August was 35.84.

APPENDIX A: DIATOM PROPORTIONAL COUNTS

Sample	Genus/Species/Variety	PTC	Count	Percent
185501	Achnanthes biasolettiana	3	0	0.00
185501	Achnanthes clevei	3	0	0.00
185501	Achnanthes exigua	3	3	0.38
185501	Achnanthes lanceolata	2	1	0.13
185501	Achnanthes minutissima	3	128	16.00
185501	Amphora inariensis	3	2	0.25
185501	Amphora libyca	3	2	0.25
185501	Amphora pediculus	3	11	1.38
185501	Caloneis bacillum	2	2	0.25
185501	Cocconeis pediculus	3	324	40.50
185501	Cocconeis placentula	3	61	7.63
185501	Cyclotella meneghiniana	2	0	0.00
185501	Cymbella affinis	3	4	0.50
185501	Cymbella sinuata	3	2	0.25
185501	Diatoma vulgare	3	6	0.75
185501	Diploneis puella	2	2	0.25
185501	Epithemia adnata	2	1	0.13
185501	Epithemia sorex	3	65	8.13
185501	Epithemia turgida	3	1	0.13
185501	Fragilaria construens	3	14	1.75
185501	Fragilaria vaucheriae	2	1	0.13
185501	Gomphonema minutum	3	3	0.38
185501	Gomphonema olivaceum	3	2	0.25
185501	Gomphonema parvulum	1	8	1.00
185501	Navicula capitata	2	0	0.00
185501	Navicula capitatoradiata	2	5	0.63
185501	Navicula cryptotenella	2	22	2.75
185501	Navicula decussis	2	3	0.38
185501	Navicula kotschyi	2	0	0.00
185501	Navicula mutica	2	3	0.38
185501	Navicula pseudanglica	2	2	0.25
185501	Navicula pupula	2	1	0.13
185501	Navicula reichardtiana	2	4	0.50
185501	Navicula subminuscula	1	2	0.25
185501	Navicula tenelloides	1	2	0.25
185501	Navicula tripunctata	3	14	1.75
185501	Navicula veneta	1	2	0.25
185501	Neidium dubium	3	0	0.00
185501	Nitzschia amphibia	2	5	0.63
185501	Nitzschia apiculata	2	2	0.25
185501	Nitzschia dissipata	3	4	0.50
185501	Nitzschia fonticola	3	2	0.25
185501	Nitzschia gracilis	2	2	0.25
185501	Nitzschia hungarica	2	3	0.38
185501	Nitzschia inconspicua	2	0	0.00
185501	Nitzschia linearis	2	1	0.13
185501	Nitzschia palea	1	16	2.00
185501	Nitzschia recta	3	1	0.13
185501	Nitzschia vermicularis	2	2	0.25
185501	Pinnularia borealis	2	0	0.00
185501	Rhoicosphenia curvata	3	47	5.88
185501	Stephanodiscus hantzschii	2	4	0.50
185501	Surirella ovata	2	4	0.50
185501	Synedra ulna	2	4	0.50

Sample	Genus/Species/Variety	PTC	Count	Percent
185401	Achnanthes minutissima	3	6	0.75
185401	Amphipleura pellucida	2	1	0.13
185401	Caloneis bacillum	2	2	0.25
185401	Cocconeis pediculus	3	18	2.25
185401	Cocconeis placentula	3	7	0.88
185401	Cyclotella meneghiniana	2	3	0.38
185401	Cymbella affinis	3	57	7.13
185401	Diatoma vulgare	3	43	5.38
185401	Epithemia sorex	3	557	69.63
185401	Fragilaria vaucheriae	2	19	2.38
185401	Gomphoneis eriense	3	4	0.50
185401	Gomphonema clevei	3	2	0.25
185401	Navicula capitatoradiata	2	2	0.25
185401	Navicula cryptotenella	2	3	0.38
185401	Navicula reichardtiana	2	2	0.25
185401	Navicula tripunctata	3	0	0.00
185401	Neidium dubium	3	0	0.00
185401	Nitzschia dissipata	3	18	2.25
185401	Nitzschia gracilis	2	2	0.25
185401	Nitzschia inconspicua	2	4	0.50
185401	Nitzschia palea	1	34	4.25
185401	Rhoicosphenia curvata	3	1	0.13
185401	Rhopalodia gibba	2	0	0.00
185401	Surirella brebissonii	2	2	0.25
185401	Synedra ulna	2	13	1.63

Sample	Genus/Species/Variety	PTC	Count	Percent
185402	Achnanthes clevei	3	4	0.46
185402	Achnanthes exigua	3	7	0.80
185402	Achnanthes lanceolata	2	21	2.41
185402	Achnanthes minutissima	3	84	9.66
185402	Achnanthes subexigua	3	2	0.23
185402	Amphipleura pellucida	2	1	0.11
185402	Amphora inariensis	3	6	0.69
185402	Amphora libyca	3	5	0.57
185402	Amphora pediculus	3	22	2.53
185402	Amphora veneta	1	2	0.23
185402	Caloneis bacillum	2	4	0.46
185402	Caloneis silicula	2	5	0.57
185402	Cocconeis pediculus	3	70	8.05
185402	Cocconeis placentula	3	94	10.80
185402	Cymatopleura elliptica	2	1	0.11
185402	Cymatopleura solea	2	2	0.23
185402	Cymbella affinis	3	16	1.84
185402	Cymbella sinuata	3	16	1.84
185402	Cymbella tumida	3	3	0.34
185402	Diatoma vulgare	3	9	1.03
185402	Epithemia adnata	2	4	0.46
185402	Epithemia sorex	3	78	8.97
185402	Epithemia turgida	3	3	0.34
185402	Fragilaria construens	3	134	15.40
185402	Fragilaria lapponica	3	0	0.00
185402	Fragilaria vaucheriae	2	4	0.46
185402	Gomphonema angustatum	2	1	0.11
185402	Gomphonema clavatum	2	0	0.00
185402	Gomphonema minutum	3	2	0.23
185402	Gomphonema parvulum	1	12	1.38
185402	Hantzschia amphioxys	2	2	0.23
185402	Melosira varians	2	5	0.57
185402	Navicula atomus	1	8	0.92
185402	Navicula capitata	2	4	0.46
185402	Navicula capitatoradiata	2	33	3.79
185402	Navicula cryptotenella	2	56	6.44
185402	Navicula decussis	3	4	0.46
185402	Navicula gregaria	2	3	0.34
185402	Navicula libonensis	2	0	0.00
185402	Navicula menisculus v. upsaliensis	2	10	1.15
185402	Navicula minima	1	13	1.49
185402	Navicula pelliculosa	1	1	0.11
185402	Navicula pseudanglica	2	0	0.00
185402	Navicula pupula	2	1	0.11
185402	Navicula reichardtiana	2	14	1.61
185402	Navicula reinhardtii	2	0	0.00
185402	Navicula subminuscula	1	0	0.00
185402	Navicula tenelloides	1	2	0.23
185402	Navicula tripunctata	3	15	1.72
185402	Navicula veneta	1	2	0.23
185402	Nitzschia acicularis	2	1	0.11
185402	Nitzschia amphibia	2	2	0.23
185402	Nitzschia apiculata	2	4	0.46
185402	Nitzschia dissipata	3	11	1.26
185402	Nitzschia fonticola	3	2	0.23
185402	Nitzschia gracilis	2	2	0.23
185402	Nitzschia incognita	2	3	0.34
185402	Nitzschia inconspicua	2	5	0.57
185402	Nitzschia intermedia	3	1	0.11
185402	Nitzschia palea	1	9	1.03

Sample	Genus/Species/Variety	PTC	Count	Percent
185402	Nitzschia paleacea	2	2	0.23
185402	Nitzschia perminuta	3	12	1.38
185402	Nitzschia sigmoidea	3	0	0.00
185402	Nitzschia solita	1	1	0.11
185402	Rhoicosphenia curvata	3	15	1.72
185402	Rhopalodia brebissonii	1	1	0.11
185402	Rhopalodia gibba	2	11	1.26
185402	Synedra ulna	2	3	0.34

Sample	Genus/Species/Variety	PTC	Count	Percent
185502	Achnanthes biasolettiana	3	2	0.24
185502	Achnanthes clevei	3	2	0.24
185502	Achnanthes exigua	3	7	0.84
185502	Achnanthes lanceolata	2	3	0.36
185502	Achnanthes minutissima	3	41	4.93
185502	Amphipleura pellucida	2	0	0.00
185502	Amphora inariensis	3	2	0.24
185502	Amphora libyca	3	4	0.48
185502	Amphora pediculus	3	6	0.72
185502	Amphora veneta	1	1	0.12
185502	Caloneis schumanniana	2	2	0.24
185502	Caloneis silicula	2	2	0.24
185502	Cocconeis pediculus	3	33	3.97
185502	Cocconeis placentula	3	38	4.57
185502	Cyclotella meneghiniana	2	2	0.24
185502	Cymbella affinis	3	81	9.74
185502	Cymbella cistula	3	2	0.24
185502	Cymbella norvegica	3	2	0.24
185502	Cymbella silesiaca	2	5	0.60
185502	Cymbella sinuata	3	7	0.84
185502	Cymbella tumida	3	3	0.36
185502	Diatoma tenue	2	1	0.12
185502	Diatoma vulgare	3	133	15.99
185502	Diploneis puella	2	1	0.12
185502	Epithemia sorex	3	39	4.69
185502	Epithemia turgida	3	0	0.00
185502	Fragilaria construens	3	60	7.21
185502	Fragilaria pinnata	3	2	0.24
185502	Gomphoneis eriense	3	6	0.72
185502	Gomphonema minutum	3	0	0.00
185502	Gomphonema olivaceum	3	5	0.60
185502	Gomphonema truncatum	3	4	0.48
185502	Hantzschia amphioxys	2	0	0.00
185502	Melosira varians	2	6	0.72
185502	Navicula capitatoradiata	2	26	3.13
185502	Navicula cryptotenella	2	31	3.73
185502	Navicula decussis	2	4	0.48
185502	Navicula gregaria	2	4	0.48
185502	Navicula libonensis	2	2	0.24
185502	Navicula minima	1	4	0.48
185502	Navicula pseudanglica	2	4	0.48
185502	Navicula pupula	2	6	0.72
185502	Navicula subminuscula	1	2	0.24
185502	Navicula tripunctata	3	7	0.84
185502	Navicula veneta	1	2	0.24
185502	Nitzschia acicularis	2	2	0.24
185502	Nitzschia amphibia	2	6	0.72
185502	Nitzschia dissipata	3	32	3.85
185502	Nitzschia fonticola	3	8	0.96
185502	Nitzschia frustulum	2	5	0.60
185502	Nitzschia gracilis	2	6	0.72
185502	Nitzschia heufleriana	3	4	0.48
185502	Nitzschia incognita	2	6	0.72
185502	Nitzschia inconspicua	2	7	0.84
185502	Nitzschia linearis	2	2	0.24
185502	Nitzschia palea	1	104	12.50
185502	Nitzschia paleacea	2	4	0.48
185502	Nitzschia perminuta	3	2	0.24
185502	Pinnularia borealis	2	0	0.00
185502	Rhoicosphenia curvata	3	19	2.28

Sample	Genus/Species/Variety	PTC	Count	Percent
185601	Achnanthes lanceolata	2	2	0.22
185601	Achnanthes minutissima	3	4	0.44
185601	Amphipleura pellucida	2	2	0.22
185601	Amphora inariensis	3	2	0.22
185601	Amphora libyca	3	2	0.22
185601	Amphora pediculus	3	7	0.78
185601	Caloneis bacillum	2	4	0.44
185601	Cocconeis pediculus	3	11	1.22
185601	Cocconeis placentula	3	107	11.89
185601	Cymbella affinis	3	6	0.67
185601	Cymbella sinuata	3	66	7.33
185601	Diatoma vulgare	3	306	34.00
185601	Epithemia adnata	2	2	0.22
185601	Epithemia sorex	3	161	17.89
185601	Epithemia turgida	3	0	0.00
185601	Eunotia sp.	3	1	0.11
185601	Fragilaria capucina	2	6	0.67
185601	Fragilaria construens	3	14	1.56
185601	Gomphoneis eriense	3	44	4.89
185601	Gomphonema clevei	3	2	0.22
185601	Gomphonema minutum	3	4	0.44
185601	Gomphonema parvulum	1	8	0.89
185601	Melosira varians	2	2	0.22
185601	Navicula capitatoradiata	2	2	0.22
185601	Navicula decussis	2	2	0.22
185601	Navicula pseudanglica	2	0	0.00
185601	Navicula trivialis	2	0	0.00
185601	Nitzschia amphibia	2	4	0.44
185601	Nitzschia angustatula	2	0	0.00
185601	Nitzschia dissipata	3	59	6.56
185601	Nitzschia fonticola	3	4	0.44
185601	Nitzschia frustulum	2	4	0.44
185601	Nitzschia gracilis	2	4	0.44
185601	Nitzschia inconspicua	2	8	0.89
185601	Nitzschia palea	1	28	3.11
185601	Nitzschia siliqua	2	2	0.22
185601	Nitzschia vermicularis	2	2	0.22
185601	Pinnularia sp.	3	2	0.22
185601	Rhoicosphenia curvata	3	11	1.22
185601	Rhopalodia gibba	2	3	0.33
185601	Synedra ulna	2	2	0.22

Sample	Genus/Species/Variety	PTC	Count	Percent
185502	Rhopalodia gibba	2	0	0.00
185502	Stephanodiscus hantzschii	2	1	0.12
185502	Surirella ovata	2	1	0.12
185502	Synedra ulna	2	29	3.49

Appendix D. Idaho River Ecological Assessment

Introduction

The Idaho Rivers Ecological Assessment, or Large Rivers Protocols, uses both water quality and biological assessments in an attempt to determine support status of cold water biota and salmonid spawning in Idaho's large rivers. Although the Large Rivers Protocols are in a draft form and are currently receiving review by numerous individuals, it was decided to apply the protocols to the South Fork of the Owyhee River. The protocols utilizes water chemistry and physical indexes (physicochemical), macroinvertebrates, periphyton, and fish data to determine if cold water biota and salmonid spawning are supported. As a side note, the water quality information collected can assist in determining the status of recreational uses. The Large Rivers Protocols have been designed to use two of the four attributes to make a support status call.

For the South Fork of the Owyhee River, it was decided that water quality information, macroinvertebrates and periphyton would be applied and compiled through the different matrixes for these indexes. Fish information would stand alone as a determination for the status of salmonid spawning. The fish data was purposely left out because of the level of confidence from the 1999 electro-fishing effort. With the limited resources and time to complete the sub-basin assessment, an experienced crew could not be found to complete the electro-fishing effort. The effort for electro-fishing on large rivers is more complex than methods used for smaller wadable streams.

Physicochemical Index (PCI)

The index is modified from Oregon's Water Quality Index (WQI)(Cude, 1998). Modification have been made to conform to State of Idaho Water Quality Standards and to allow use of the index in the absence of parameters required to compile through the Oregon WQI (Grafe, 1999). Modifications to the Oregon WQI for use in Idaho was the use of a unweighted harmonic mean instead of a weighted geometric mean or weighted arithmetic mean. The decision to use unweighted harmonic mean was to allow for a more comprehensive examination of available water quality information. It also allows for a conservative interpretation of the total score, and allow for a conservative scoring for determining support status.

Each dates parameter is calculated for it's harmonic mean as demonstrated in Tables 1 through 4. For each date then the harmonic mean is re-calculated to obtain the final score. Scoring is based on 0 to 100 scale, with 10 being "very poor" water quality. A 100 score would be "excellent."

Scores are then developed for each index. For the PCI the following scoring matrixes were used

1. Scores between 0-39 were below threshold value, and a not full support status was called

2. Scores between 40-60, a score of "1" was assigned

3. Scores between 61-80, a score of "3" was assigned

4. Scores >80, were given a "5"

Table 1. PCI Scores for the South Fork of the Owyhee River at the El Paso Pipeline, with Temperature data.

Stream Name:	SF Owyhee
Station:	Pipeline
Calculated OWQI=	82.36460748
Stream Classification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp ©	DOmg/L	pH	Fecal Coli	Total Solids	nh3+no2+no3	TPmg/L	BOD5	sit	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
1999	5	12	4.00	10.00	8.00	20	244.000	0.018	0.166	1	100	98.52 537	81.92 926	100	80.67 981	99.17 45	50.27 245	98	81.40 942
1999	6	14	20.90	7.92	8.32	22	197.000	0.015	0.113	1	69.50 553	84.39 655	81.92 926	84.66 004	86.56 432	99.31 161	66.15 014	98	81.53 48
1999	7	13	24.30	10.60	8.77	16	211.000	0.022	0.031	1	45.40 222	100	81.92 926	67.06 847	84.76 796	98.99 199	90.71 411	98	74.97 254
1999	8	17	20.00	10.00	9.00	2	202.000	0.043	0.043	1	74.61 255	98.52 537	81.92 926	59.52 498	85.91 844	98.03 928	87.11 95	98	82.01 836
1999	9	22	12.80	11.25	8.01	12	243.000	0.023	0.026	1	97.99 544	100	81.92 926	99.48 257	80.60 074		92.21 185	98	91.88 793

Table 2. PCI Scores for the South Fork of the Owyhee River at the El Paso Pipeline, without Temperature data

Stream Name:	S F Owyhee
Station:	Pipeline
Calculated OWQI=	84.79158638
Stream Classification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp ©	DOmg /L	pH	Fecal Coli	Total Solids	nh3+no2+no3	TPmg /L	BOD5	sit	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
1999	5	12		10.00	8.00	20	244.000	0.018	0.168	1		98.52 537	81.92 926	100	80.67 981	99.17 45	50.27 245	98	79.51 645
1999	6	14		7.92	8.32	22	197.000	0.015	0.113	1		84.39 655	81.92 926	84.66 004	86.56 432	99.31 161	66.15 014	98	83.81 753
1999	7	13		10.60	8.77	16	211.000	0.022	0.031	1		100	81.92 926	67.06 847	84.76 796	98.99 199	90.71 411	98	86.38 003
1999	8	17		10.00	9.00	2	202.000	0.043	0.043	1		98.52 537	81.92 926	59.52 498	85.91 844	98.03 928	87.11 95	98	83.26 7
1999	9	22		11.25	8.01	12	243.000	0.023	0.026	1		100	81.92 926	99.48 257	80.80 074		92.21 185	98	90.97 692

Table 3. PCI Scores for the South Fork of the Owyhee River at the 45 Ranch, with Temperature data

Stream Name:	SF Owyhee
Station:	45 Ranch
Calculated OWQI=	75.44623116
Stream Classification	Poor

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp ©	DOmg /L	pH	Fecal Coli	Total Solids	nh3+no2+no3	TPmg /L	BOD5
1999	5	12	4.00	10.00	8.00	46	269.000	0.061	0.202	1
1999	6	14	24.00	8.00	8.41	10	206.000	0.038	0.112	1
1999	7	13	26.00	7.50	9.15	2	218.000	0.019	0.031	1
1999	8	17	22.00	9.20	8.73	2	168.000	0.023	0.045	1
1999	9	22	20.30	12.67	8.23	2	229.000	0.022	0.024	1

sit	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
100	98.52 537	81.92 926	100	77.71 45	97.22 997	39.48 715	98	73.80 095
47.84 447	85.16 399	81.92 926	80.84 007	85.40 52	98.26 528	66.44 972	98	74.32 987
30.36 503	80.07 352	81.92 926	55.06 861	83.88 381	99.12 884	90.71 411	98	60.45 664
62.55 274	94.52 491	81.92 926	68.47 475	90.40 736	98.94 641	86.52 039	98	81.92 53
72.96 759	100	81.92 926	88.75 255	82.51 303		92.81 095	98	86.71 839

Table 4. PCI Scores for the South Fork of the Owyhee River at the 45 Ranch, without Temperature data.

Stream Name:	SF Owyhee
Station:	45 Ranch
Calculated OWQI=	82.1319047
Stream Classification	Fair

Some modifications that will likely have to be made to your data set:

Must sum Ammonia and Nitrite+Nitrate

Must convert Specific conductivity to TDS and then add TDS and TSS to give you TS.

YY	MM	DD	Temp ©	DOmg/L	pH	Fecal Coli	Total Solids	nh3+no2+no3	TPmg/L	BOD5
1999	5	12		10.00	8.00	46	269.000	0.061	0.202	1
1999	6	14		8.00	8.41	10	206.000	0.038	0.112	1
1999	7	13		7.50	9.15	2	218.000	0.019	0.031	1
1999	8	17		9.20	8.73	2	168.000	0.023	0.045	1
1999	9	22		12.67	8.23	2	229.000	0.022	0.024	1

slt	sido	sibod	siph	sits	sinit	sitp	sifc	OWQI
	98.52 537	81.92 926	100	77.71 45	97.22 997	39.48 715	98	71.51 171
	85.16 399	81.92 926	80.84 007	85.40 52	98.26 528	66.44 972	98	83.20 434
	80.07 352	81.92 926	55.06 861	83.88 381	99.12 884	90.71 411	98	79.61 975
	94.52 491	81.92 926	68.47 475	90.40 736	98.94 641	86.52 039	98	86.46 2
	100	81.92 926	88.75 255	82.51 303		92.81 095	98	89.86 173

Final Scores and Analysis

Table 5. Shows the final scores for the five monitoring dates at both the El Paso Pipeline site and the 45 Ranch site. Overall the final scores shows that water quality degrades from the El Paso Pipeline site (Nevada) to the 45 Ranch site in Idaho. Water quality in Idaho was calculated to be in "poor" condition, while at the El Paso Pipeline site water quality was "fair." With temperature data removed from the calculations, both sites were in the "fair" category.

Table 5. Final PCI Scores and Final Score Class.

Stations	PCI Score with Temperature Data	Final Score	PCI Score without Temperature Data	Final Score
El Paso Pipeline, Nevada	82.3	5	84.8	5
45 Ranch, Idaho	75.4	3	82.1	5

Periphyton

Periphyton samples were collected in July and August, 1999. Samples were collected at the El Paso Pipeline site, Nevada, and at 45 Ranch, Idaho. Samples were sent to Dr. Loren Bahls in Helena, Montana for analysis and interpretation. Dr. Bahls' report is located in Appendix C.

Results were compiled through the Diatom-Idaho Biotic Index (D-IBI)(Grafe, 1999). The ten matrixes, or attributes, used included; percent sensitivity, percent tolerant, percent motile, eutrophic species richness, alkaphilic richness, percent high oxygen, low oxygen species richness, percent adnate, percent biraphid, and percent deformed cells. Scores were broken down as follows:

1. percent sensitivity; <60=1, 60-80=3, >80=5
2. percent tolerant; >15=1, 15-3=3, <3=5
3. percent motile; >40=1, 40-15=3, <15=5
4. eutrophic species richness; >20=1, 20-12=3, <12=5
5. alkaphilic richness; >30=1, 30-18=3, <18=5
6. percent high oxygen; <25=1, 25-55=3, >55=5
7. low oxygen species richness; >5=1, 5-2.5=3, <2.5=5
8. percent adnate; >4=1, 4-2=3, <2=5
9. percent biraphid; >20=1, 20-5=3, <5=5
10. deformed cells; >1=1, <1=5

Scores are summed and compiled with scores less than or equal to 20 being the threshold value for support status and a determination of non-support. Scores from 21 to 30 is scored as a "1," scores between 31 and 40 is scored as "3," and scores greater than 40 is given a "5". Table 6 shows the results and the Final Large Rivers Assessment score for periphyton. Tables 7 through 10 show the final scoring results at the individual stations for July and August.

Table 6. Final Periphyton Scores and Final Score Class.

Stations	D-IBI Score July	Final Score	D-IBI Score August	Final Score
El Paso Pipeline, Nevada	42	5	30	3
45 Ranch, Idaho	30	3	20[1]	0[1]

[1] D-IBI Score Exceeds the Threshold Value

For the D-IBI, Idaho uses metrics or attributes developed by a variety of authors; Bahls (1993), Van Dam et al. (1994), Barbour et al. (1998), Hill et al. (ms), Whitton and Kelly (1995)....etc, IN: Idaho Rivers Ecological Assessment Framework (Grafe, 1999) and compiled by Leska S. Fore for the State of Idaho Division of Environmental Quality. Some of the species found in July and August, for both stations, did not have the attributes known. As an example; it is not known which tolerant value, or other attributes, *Nitzchia disspata* would fall into. Lack of information for *Synedra ulna* cannot determine if it's low oxygen tolerant, alkaphilic or trophic status. Overall there were approximately ten species found in the South Fork of the Owyhee River where certain attributes could not defined. How much the lack of information impacted the overall rating is not known. It is hoped, that between the period when this document receives public review, and final submittal to the U. S. Environmental Protection Agency,-more information can be found on the species in question.

More information and analysis of species found in Idaho's large rivers needs to occur before full application of the D-IBI. Very little is known of the species composition, especially in the high desert rivers in southern Idaho. Dr. Bahls recommended that Idaho begin work on developing biocriteria for streams and rivers in the High Desert region of the Snake River Basin.

SF [illegible] River

July, 1998 [illegible]

[illegible] 7 [illegible]

FAMILY	GENUS	SPECIES	Count	% of Total	PLL TO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	4	0.75%	3	PR	PR			•			3	2	2	1	2	7
[illegible]	[illegible]	[illegible]	1	0.13%														
[illegible]	[illegible]	[illegible]	2	0.25%	2	SI	OR											
[illegible]	[illegible]	[illegible]	18	2.25%	3	CO	PR						4	2	1	2	2	1
[illegible]	[illegible]	[illegible]	7	0.88%	3	CO	PR			•			4	3	2	2	2	4
[illegible]	[illegible]	[illegible]	3	0.38%	2	CN				•			4	2	2	3	2	5
[illegible]	[illegible]	[illegible]	57	7.13%	3	ST						1	4	3	3	3	4	4
[illegible]	[illegible]	[illegible]	43	5.38%	3	ER							4	2	1	1	2	3
[illegible]	[illegible]	[illegible]	567	70.97%	3	E	E	NF					5	2	2	2	2	3
[illegible]	[illegible]	[illegible]	19	2.38%	2	ER				•	•		5	2	1	2	2	4
[illegible]	[illegible]	[illegible]	4	0.50%	3	ST				•			4	2	2	3	3	3
[illegible]	[illegible]	[illegible]	2	0.25%						•								
[illegible]	[illegible]	[illegible]	2	0.25%	2	NV	OR		M	•			4	2	2	3	3	3
[illegible]	[illegible]	[illegible]	3	0.38%	3	NV	PR		M	•			3	2	2	3	3	5
[illegible]	[illegible]	[illegible]	2	0.25%	2	NV	PR		M	•			4	2	1	4	3	1
[illegible]	[illegible]	[illegible]	0	0.00%														
[illegible]	[illegible]	[illegible]	18	2.25%														
[illegible]	[illegible]	[illegible]	2	0.25%	2	SI	PR		M	•			3	1	[illegible]	2	2	3
[illegible]	[illegible]	[illegible]	4	0.50%	2	SI	PR		M	•			4	2	4	3	3	3
[illegible]	[illegible]	[illegible]	34	4.25%	2	SI	PR			•	[illegible]		3	2	2	1	2	3
[illegible]	[illegible]	[illegible]	1	0.13%	2	AG				•			4	2	2	2	2	2
[illegible]	[illegible]	[illegible]	2	0.00%	2	[illegible]		[illegible]		•			[illegible]	2	1	2	2	1
[illegible]	[illegible]	[illegible]	2	0.25%	2	[illegible]			[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	13	1.63%	2	PR							[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]															

	[illegible] Score	[illegible] Score
% [illegible]	87.0	5
% [illegible]	0.0	5
% [illegible]	8.4	5
[illegible] Species Richness	9.0	5
[illegible] Species Richness	14.0	5
% High Oxygen	12.3	1
Low Oxygen Species Richness	5.0	3
% [illegible]	0.1	5
%[illegible]	9.3	3
% Dominant [illegible]	0.0	5
		42

South Fork Owyhee at El Paso Pipeline

Aug-99

Table 5. D-IBI Calculations and Diatom Species

FAMILY	GENUS	SPECIES	Count	%	POLL TOL	Guild-m	Nfix	Motile	Ptwt	Orvd	TrophStat
Achnanthaceae	Achnanthes	clevei	4	0.46%	3	PR			4	2	4
Achnanthaceae	Achnanthes	exigua	7	0.81%	3	PR			4	1	7
Achnanthaceae	Achnanthes	lanceolata	21	2.43%	3	PR			4	3	5
Achnanthaceae	Achnanthes	minutissima	84	9.71%	3	PR			3	1	7
Achnanthaceae	Achnanthes	species	2	0.23%	3	PR			x	x	x
Amphipleuraceae	Amphipleura	pellucida	1	0.12%	2	BI			4	2	2
Catenulaceae	Amphora	inariensis	6	0.69%	2	AD			x	x	x
Catenulaceae	Amphora	libyca	5	0.58%	2	AD			x	x	x
Catenulaceae	Amphora	pediculus	22	2.54%	2	AD			4	2	5
Catenulaceae	Amphora	veneta	2	0.23%	2	AD			5	3	5
Pinnulariaceae	Caloneis	bacillum	4	0.46%	2	BI			4	2	4
Pinnulariaceae	Caloneis	silicula	5	0.58%	2	BI			4	2	4
Achnanthaceae	Cocconeis	pediculus	70	8.09%	3	CO			4	2	5
Achnanthaceae	Cocconeis	placentula	94	10.87%	3	CO			4	3	5
Cymbellaceae	Cymbella	affinis	16	1.85%	3	ST			4	1	5
Cymbellaceae	Cymbella	tumida	16	1.85%	3	ST			4	1	4
Cymbellaceae	Cymbella	sinuata	3	0.35%	3	ST			3	1	3
Fragilariaceae	Diatoma	vulgare	9	1.04%	3	ER			5	2	4
Epithemiaceae	Epithemia	adnata	4	0.46%	2	X	NF		5	2	4
Epithemiaceae	Epithemia	sorex	78	9.02%	3	X	NF		5	2	5
Epithemiaceae	Epithemia	turgida	3	0.35%	3	X	NF		5	2	4
Fragilariaceae	Fragilaria	construens	134	15.49%	3	ER			4	1	4
Fragilariaceae	Fragilaria	lapponica	0	0.00%	3	ER			4	x	x
Fragilariaceae	Fragilaria	vaucheriae	4	0.46%	2	ER			4	3	5
Gomphonemataceae	Gomphonema	angustatum	1	0.12%	2	ST			4	1	1
Gomphonemataceae	Gomphonema	clavatum	0	0.00%	2	ST			3	1	4
Gomphonemataceae	Gomphonema	minutum	2	0.23%	3	ST			3	x	5
Gomphonemataceae	Gomphonema	olivaceum	12	1.39%	3	ST			5	2	5
Gomphonemataceae	Gomphonema	parvulum	2	0.23%	1	ST			1	4	5
Melosiraceae	Melosira	varians	5	0.58%	2	CH			4	3	5
Naviculaceae	Navicula	atomus	8	0.92%	1	NV		M	4	2	8
Naviculaceae	Navicula	capitata	4	0.46%	2	NV		M	4	3	4
Naviculaceae	Navicula	capitatoradiata	33	3.82%	2	NV		M	4	3	5
Naviculaceae	Navicula	cryptocephala	56	6.47%	3	NV		M	3	3	7
Naviculaceae	Navicula	decussis	4	0.46%	3	NV		M	4		4
Naviculaceae	Navicula	minima	13	1.50%	3	NV		M	4	4	5
Naviculaceae	Navicula	minuscula	10	1.16%	1	NV		M	4	x	1
Naviculaceae	Navicula	pelliculosa	1	0.12%	1	NV		M	4	x	2
Naviculaceae	Navicula	pupula	0	0.00%	2	NV		M	3	3	4
Naviculaceae	Navicula	reichardtiana	1	0.12%	2	NV		M	4	x	x
Naviculaceae	Navicula	subminuscula	14	1.62%	1	NV		M	4	4	5
Naviculaceae	Navicula	tenelloides	0	0.00%	1	NV		M	4	1	5
Naviculaceae	Navicula	tripunctata	0	0.00%	2	NV		M	4	2	5
Naviculaceae	Navicula	veneta	2	0.23%	1	NV		M	4	4	5
Bacillariaceae	Nitzschia	acicularis	1	0.12%	2	BI		M	4	4	5
Bacillariaceae	Nitzschia	amphibia	2	0.23%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	apiculata	4	0.46%	2	BI		M	x	x	x
Bacillariaceae	Nitzschia	dissipata	11	1.27%	3	BI		M	4	2	4
Bacillariaceae	Nitzschia	levidensis	2	0.23%	3	BI		M	4	2	4
Bacillariaceae	Nitzschia	gracilis	2	0.23%	2	BI		M	3	2	3
Bacillariaceae	Nitzschia	incognita	3	0.35%	2	BI		M	x	x	x
Bacillariaceae	Nitzschia	inconspicua	5	0.58%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	intermedia	1	0.12%	3	BI		M	3	x	5
Bacillariaceae	Nitzschia	cf. palea	9	1.04%	2	BI		M	x	x	x
Bacillariaceae	Nitzschia	paleacea	2	0.23%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	perminuta	12	1.39%	3	BI		M	4	1	2
Bacillariaceae	Nitzschia	sigmoidea	0	0.00%	3	BI		M	4	3	5
Bacillariaceae	Nitzschia	sp. 2 ANS Idaho	1	0.12%	2	BI		M	x	x	x
Rhoicospheniaceae	Rhoicosphenia	curvata	19	2.20%	3	AD			4	2	5
Rhopalodiaceae	Rhopalodia	gibba	0	0.00%	2	AD	NF		5	3	5
Fragilariaceae	Synedra	ulna	29	3.35%	2	ER			x	x	x
			865								

	Metric Scores	D-IBI Score
% Sensitive	77.5	3
% Tolerant	4.3	3
% Motile	23.2	3
Eutrophic Species Richness	27.0	1
Alkaphilic Species Richness	4.0	5
% High Oxygen	31.8	3
Low Oxygen Species Richness	5.0	3
% Adnate	6.2	1
%Biraphid	7.5	3
% Deformed Cells	0.0	5

D-IBI Score 30

Significant Deviation from Expected Conditions

SF Owyhee River
July, 1999 @ 45 Ranch
Table 9 D-IBI and Diatom Species

FAMILY	GENUS	SPECIES	Count	Percent	OLL TO	Guild-m	Nfix	Motile	PHwd	Cwwd	TrophShvt
Achnanthaceae	Achnanthes	biasolettiana	0	0	3	PR			4	x	3
Achnanthaceae	Achnanthes	clevei	0	0.00%	3	PR			4	2	4
Achnanthaceae	Achnanthes	exigua	3	0.38%	3	PR			4	1	7
Achnanthaceae	Achnanthes	lanceolata	1	0.13%	3	PR			4	3	5
Achnanthaceae	Achnanthes	minutissima	128	16.00%	3	PR			3	1	7
Catenulaceae	Amphora	iranensis	2	0.25%	2	AD			x	x	1
Catenulaceae	Amphora	libyca	2	0.25%	2	AD			x	x	x
Catenulaceae	Amphora	pediculus	11	1.38%	2	AD			4	2	5
Pinnulariaceae	Caloneis	bacillum	2	0.25%	2	BI			4	2	4
Achnanthaceae	Cocconeis	pediculus	324	40.50%	3	CO			4	2	5
Achnanthaceae	Cocconeis	placentula	61	7.63%	3	CO			4	3	5
Stephanodiscaceae	Cyclotella	meneghiniana	0	0.00%	2	CN			4	5	5
Cymbellaceae	Cymbella	affinis	4	0.50%	3	ST			4	1	5
Cymbellaceae	Cymbella	sinuata	2	0.25%	3	ST			3	1	3
Fragilariaceae	Diatoma	vulgare	6	0.75%	3	ER			5	2	4
Diploneidaceae	Diploneis	puella	2	0.25%	2	BI			4	1	3
Epithemiaceae	Epithemia	adnata	1	0.13%	2	X	NF		5	2	4
Epithemiaceae	Epithemia	sorex	65	8.13%	3	X	NF		5	2	5
Epithemiaceae	Epithemia	turgida	1	0.13%	3	X	NF		5	2	4
Fragilariaceae	Fragilaria	construens	14	1.75%	3	ER			4	1	4
Fragilariaceae	Fragilaria	vaucheriae	1	0.13%	2	ER			4	3	5
Gomphonemataceae	Gomphonema	minutum	3	0.38%	3	ST			3	x	5
Gomphonemataceae	Gomphonema	olivaceum	2	0.25%	3	ST			5	2	5
Gomphonemataceae	Gomphonema	parvulum	8	1.00%	1	ST			3	4	5
Naviculaceae	Navicula	capitata	0	0.00%	2	NV		M	4	3	4
Naviculaceae	Navicula	capitatoradiata	5	0.63%	2	NV		M	4	3	5
Naviculaceae	Navicula	cryptocephala	22	2.75%	3	NV		M	3	3	7
Naviculaceae	Navicula	decussis	3	0.38%	3	NV		M	4		4
Naviculaceae	Navicula	kotschyi	0	0.00%	2	NV		M	4	1	x
Naviculaceae	Navicula	minuscula	3	0.38%	1	NV		M	4	x	1
Naviculaceae	Navicula	pelliculosa	2	0.25%	1	NV		M	4	x	2
Naviculaceae	Navicula	pupula	1	0.13%	2	NV		M	3	3	4
Naviculaceae	Navicula	reichardtiana	4	0.50%	2	NV		M	4	x	x
Naviculaceae	Navicula	subminuscula	2	0.25%	1	NV		M	4	4	5
Naviculaceae	Navicula	tenelloides	2	0.25%	1	NV		M	4	1	5
Naviculaceae	Navicula	tripunctata	14	1.75%	2	NV		M	4	2	5
Naviculaceae	Navicula	veneta	2	0.25%	1	NV		M	4	4	5
Bacillariaceae	Nitzschia	amphibia	5	0.63%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	apiculata	2	0.25%	2	BI		M	x	x	x
Bacillariaceae	Nitzschia	dissipata	4	0.50%	3	BI		M	4	2	4
Bacillariaceae	Nitzschia	fonticola	2	0.25%	3	BI		M	4	2	4
Bacillariaceae	Nitzschia	gracilis	2	0.25%	2	BI		M	3	2	3
Bacillariaceae	Nitzschia	hungarica	3	0.38%	2	BI		M	4	4	5
Bacillariaceae	Nitzschia	inconspicua	0	0.00%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	linearis	1	0.13%	2	BI		M	4	2	4
Bacillariaceae	Nitzschia	paleacea	16	2.00%	2	BI		M	4	3	5
Bacillariaceae	Nitzschia	recta	1	0.13%	3	BI		M	4	2	7
Bacillariaceae	Nitzschia	sp. 2 ANS Idah	2	0.25%	2	BI		M	x	x	x
Pinnulariaceae	Pinnularia	borealis	0	0.00%	2	BI			3	1	2
Rhoicospheniaceae	Rhoicosphenia	curvata	47	5.88%	3	AD			4	2	5
Stephanodiscaceae	Stephanodiscus	hantzschii	4	0.50%	2	CN			5	4	5
Surirellaceae	Surirella	ovata	4	0.50%	2	AD		M	x	x	x
Fragilariaceae	Synedra	ulna	4	0.50%	2	ER			x	x	x
			800								

	Metric Scores	D-IBI Score
% Sensitive	86.7	5
% Tolerant	1.4	5
% Motile	12.8	5
Eutrophic Species Richness	22.0	1
Alkaphilic Species Richness	40.0	1
% High Oxygen	19.4	1
Low Oxygen Species Richness	5.0	3
% Adnate	7.8	1
%Biraphid	5.0	3
% Deformed Cells	0.0	5
		30

D-IBI Score 30

Significant Deviation from Expected Condition

South Fork Owyhee at 45 Ranch

Aug-98

Table 10. O-IBI Calculations and Diatom Species

FAMILY	GENUS	SPECIES	Count	%	POLL TOL	Guild-m	Motile	Pnvcd	Oxyvd	TrophStvd
Achnanthaceae	Achnanthes	biasolettiana	2	0.24%	3	PR		4	[illegible]	3
Achnanthaceae	Achnanthes	clevei	2	0.24%	3	PR		4	2	4
Achnanthaceae	Achnanthes	exigua	7	0.84%	3	PR		4	1	7
Achnanthaceae	Achnanthes	lanceolata	3	0.36%	3	PR		4	3	5
Achnanthaceae	Achnanthes	minutissima	41	4.92%	3	PR		3	1	7
Amphipleuraceae	Amphipleura	pellucida	0	0.00%	2	BI		4	2	2
Catenulaceae	Amphora	inariensis	2	0.24%	2	AO		[illegible]	[illegible]	1
Catenulaceae	Amphora	libyca	4	0.48%	3	AO		[illegible]	[illegible]	[illegible]
Catenulaceae	Amphora	pediculus	6	0.72%	2	AO		4	2	5
Catenulaceae	Amphora	veneta	1	0.12%	2	AO		5	3	5
Pinnulariaceae	Caloneis	species	2	0.24%	3	BI		[illegible]	[illegible]	[illegible]
Pinnulariaceae	Caloneis	silicula	2	0.24%	2	BI		4	2	4
Achnanthaceae	Cocconeis	pediculus	33	3.97%	3	CO		4	2	5
Achnanthaceae	Cocconeis	placentula	38	4.57%	3	CO		4	3	5
Stephanodiscaceae	Cyclotella	meneghiniana	2	0.24%	2	CN		4	5	5
Cymbellaceae	Cymbella	affinis	61	7.33%	3	ST		4	1	5
Cymbellaceae	Cymbella	cistula	2	0.24%	3	ST		4	2	3
Cymbellaceae	Cymbella	species	2	0.24%	3	ST		[illegible]	[illegible]	[illegible]
Cymbellaceae	Cymbella	species	5	0.60%	3	ST		[illegible]	[illegible]	[illegible]
Cymbellaceae	Cymbella	sinuata	7	0.84%	3	ST		3	1	3
Cymbellaceae	Cymbella	tumida	3	0.36%	3	ST		4	1	4
Fragilariaceae	Diatoma	tenue	1	0.12%	2	ER		4	3	5
Fragilariaceae	Diatoma	vulgare	133	15.99%	3	ER		5	2	4
Diploneidaceae	Diploneis	puella	1	0.12%	2	BI		4	1	3
Epithemiaceae	Epithemia	sorex	39	4.69%	3	X		5	2	5
Fragilariaceae	Fragilaria	construens	60	7.21%	3	ER		4	1	4
Fragilariaceae	Fragilaria	lapponica	2	0.24%	3	ER		4	[illegible]	[illegible]
Epithemiaceae	Epithemia	species	6	0.72%	2	X		[illegible]	[illegible]	[illegible]
Gomphonemataceae	Gomphonema	minutum	0	0.00%	3	ST		3	[illegible]	5
Gomphonemataceae	Gomphonema	olivaceum	5	0.60%	3	ST		5	2	6
Gomphonemataceae	Gomphonema	truncatum	4	0.48%	3	ST		4	2	6
Bacillariaceae	Hantzschia	amphioxys	0	0.00%	2	BI		3	2	7
Melosiraceae	Melosira	varians	6	0.72%	2	CH		4	3	5
Naviculaceae	Navicula	capitatoradiata	26	3.13%	2	NV	M	4	3	5
Naviculaceae	Navicula	cryptocephala	31	3.73%	3	NV	M	3	3	7
Naviculaceae	Navicula	decussis	4	0.48%	3	NV	M	4		4
Naviculaceae	Navicula	gregaria	4	0.48%	2	NV	M	4	4	5
Naviculaceae	Navicula	minima	4	0.48%	1	NV	M	4	4	5
Naviculaceae	Navicula	pupula	6	0.72%	2	NV	M	3	3	4
Naviculaceae	Navicula	subminuscula	2	0.24%	1	NV	M	4	4	5
Naviculaceae	Navicula	tripunctata	7	0.84%	2	NV	M	4	2	5
Naviculaceae	Navicula	veneta	2	0.24%	1	NV	M	4	4	5
Bacillariaceae	Nitzschia	acicularis	6	0.72%	2	BI	M	4	4	5
Bacillariaceae	Nitzschia	amphibia	32	3.85%	2	BI	M	4	3	5
Bacillariaceae	Nitzschia	dissipata	8	0.96%	3	BI	M	4	2	[illegible]
Bacillariaceae	Nitzschia	fonticola	8	0.96%	3	BI	M	4	2	4
Bacillariaceae	Nitzschia	frustulum	5	0.60%	2	BI	M	4	3	5
Bacillariaceae	Nitzschia	gracilis	6	0.72%	2	BI	M	3	2	4
Bacillariaceae	Nitzschia	heufleriana	4	0.48%	3	BI	M	4	[illegible]	[illegible]
Bacillariaceae	Nitzschia	[illegible]	6	0.72%	2	BI	M	[illegible]	[illegible]	3
Bacillariaceae	Nitzschia	inconspicua	7	0.84%	2	BI	M	4	3	[illegible]
Bacillariaceae	Nitzschia	linearis	2	0.24%	2	BI	M	4	2	4
Bacillariaceae	Nitzschia	palea	104	12.50%	1	BI	M	3	4	6
Bacillariaceae	Nitzschia	paleacea	4	0.48%	2	BI	M	4	3	[illegible]
Bacillariaceae	Nitzschia	perminuta	2	0.24%	3	BI	M	4	1	5
Pinnulariaceae	Pinnularia	borealis	19	2.28%	2	BI		3	1	2
Rhopalodiaceae	Rhopalodia	gibba	0	0.00%	2	AO		5	3	5
Stephanodiscaceae	Stephanodiscus	hantzschii	1	0.12%	2	CN		5	4	6
Surirellaceae	Surirella	ovata	1	0.12%	2	AO	M	[illegible]	[illegible]	[illegible]
Fragilariaceae	Synedra	ulna	29	3.49%	2	ER		[illegible]	[illegible]	5
										[illegible]
			832							

	Metric Scores	O-IBI Score
% Sensitive	56.9	1
% Tolerant	18.7	1
% Motile	35.9	3
Eutrophic Species Richness	21	1
Alkaphilic Species Richness	43	1
% High Oxygen	17.55	1
Low Oxygen Species Richness	8	1
% Acraty	1.68	5
%Biraphid	26.07	1
% Deformed Cells	0	5

Threshold Value O-IBI less then or equal to 20

Macroinvertebrates

Two sets of macroinvetebrates were collected, once in July and again in August. Two sets were decided to be collected to assist in determining if there was any temporal variability for the two sites.

The macroinvertebrates index Idaho Rivers Index (IRI) developed by Royer and Minshall (1996, 1997 & 1999). The index uses five matrixes; EPT Richness, taxa richness, percent dominance, percent elmidae, and percent predators. Scoring methods are described in the Idaho Rivers Ecological Assessment Framework. The final scoring are described in Table 7. All macroinvertebrates data are located in Appendix B. Individual IRI test on stations and dates are located in Tables 12 through 15.

Scores are then developed for each index. For the IRI the following scoring matrixes were used

1.Scores between <10 were below threshold value, and a not full support status was called

2. Scores between 11-13, a score of "1" was assigned

3. Scores between-16, a score of "3" was assigned

4. Scores >16, were given a "5"

Table 11. Final Macroinvertebrates Scores and Final Score Class.

Stations	IRI Score July	Final Score	IRI Score August	Final Score
El Paso Pipeline, Nevada	23	5	21	5
45 Ranch, Idaho	19	5	21	5

Final scoring for macroinvertebrates would indicate cold water biota is supported according to the IRI.

DRAFT: IDEQ [illegible] SCORE CALCULATION WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ Pipeline
Site ID:	
Date:	13-Jul-99

T CODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL		TEMP (C)	FFG	#Predator	EPT TAXA?	ELMIDAE?	TAXARICH	%PREDGEM
781	11	Acentrella turbida	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	11
20	93	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5		0	CG	0	1	0	1	93
41	7	Caudatella heterocaudata McDunnough	Ephemeroptera	Ephemerellidae	1		possibly Col	CG	0	1	0	1	7
28	2	Epeorus albertae	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	2
616	31	Ephemerella infrequens/inermis	Ephemeroptera	Ephemerellidae	11		0	CG	0	1	0	1	31
35	8	Rhithrogena	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	8
57	24	Tricorythodes	Ephemeroptera	Tricorythidae	5		0	CG	0	1	0	1	24
1	7	Gomphidae	Odonata	Gomphidae	1		0	PR	7	0	0	1	7
113	1	Hesperoperla pacifica (Banks)	Plecoptera	Perlidae	1		0	PR	1	1	0	1	1
127	7	Isoperla	Plecoptera	Perlodidae	2		0	PR	7	1	0	1	7
233	16	Brachycentrus occidentalis	Trichoptera	Brachycentridae	1		0	CF	0	1	0	1	16
197	1	Cheumatopsyche	Trichoptera	Hydropsychidae	5		0	CF	0	1	0	1	1
583	1	Chimarra	Trichoptera	Philopotamidae	11		0	CF	0	1	0	1	1
238	97	Helicopsyche	Trichoptera	Helicopsychidae	3		0	SC	0	1	0	1	97
198	80	Hydropsyche	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	80
196	2	Hydropsychidae	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	2
182	2	Hydroptila	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	2
639	5	Nectopsyche	Trichoptera	Leptoceridae	3		0	UN	0	1	0	1	0
244	6	Oecetis	Trichoptera	Leptoceridae	6		0	PR	6	1	0	1	6
179	30	Protoptila	Trichoptera	Glossosomatidae	1		0	SC	0	1	0	1	30
248	7	Petrophila	Lepidoptera	Pyralidae	5		0	SC	0	0	0	1	7
848	17	Microcylloepus	Coleoptera	Elmidae	4		0	CG	0	0	17	1	17
287	4	Optioservus	Coleoptera	Elmidae	4		0	SC	0	0	4	1	4
874	2	Psephenus	Coleoptera	Psephenidae	4		0	SC	0	0	0	1	2
271	2	Zaitzevia	Coleoptera	Elmidae	4		0	CG	0	0	2	1	2
292	1	Blephariceridae	Diptera	Blephariceridae	0		Cold	SC	0	0	0	1	1
770	1	Ceratopogoninae	Diptera	Ceratopogonidae	6		0	PR	1	0	0	1	1
635	2	Hemerodromia/Chelifera	Diptera	Empididae	6		0	PR	2	0	0	1	2
298	1	Hexatoma	Diptera	Tipulidae	2		0	PR	1	0	0	1	1
303	74	Simulium	Diptera	Simuliidae	6		0	CF	0	0	0	1	74
326	1	Cardiocladius	Diptera	Chironomidae	5		0	PR	1	0	0	1	1
329	1	Cladotanytarsus	Diptera	Chironomidae	7		0	CG	0	0	0	1	1
333	1	Cricotopus	Diptera	Chironomidae	7		0	SH	0	0	0	1	1
349	1	Eukiefferiella devonica	Diptera	Chironomidae	6		0	CG	[illegible]	0	0	1	1
357	1	Lopescladius	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
905	1	NEW TAXA ASOF 981101 10	0		0	11	0	UN	0	0	0	0	0
386	2	Polypedilum	Diptera	Chironomidae	6		0	SH	0	0	0	1	2
986	4	NEW TAXA ASOF 981101 10	0		0	11	0	UN	0	0	0	0	0
453	1	Acari	Acari		0 11		0	PR	1	0	0	1	1
417	2	Nematoda	0		0 5		0	PA	0	0	0	1	2
		0	0		0	0	0	0	0	0	0	0	0
		0	0		0	0	0	0	0	0	0	0	0
		0	0		0	0	0	0	0	0	0	0	0
		0	0		0	0	0	0	0	0	0	0	0
	537								27	19	23	38	527

TOTAL IRI		23.000
SITE ID:		
River	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	38.0000
5	EPTRICHNESS	19.0000
5	%DOM	0.1806
5	%ELMIDAE	0.0428
3	%PREDATORS	0.0512

SCORING TABLES

	score	ISU Breakpoints
taxarich		
0.0000	1	<19
19.0000	3	19 - 22
22.0001	5	>22
eptrich	score	
0.0000	1	<9
9.0000	3	9 - 17
17.0001	5	>17
%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.665
0.6651	1	>0.665
%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014
%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

[illegible] WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ Pipeline
Site ID:	
Date:	23-Aug-98

CODE	NUMBER	NAME	ORDER	FAMILY	TOL VA		TEMP TOL	FFG	%Predator	EPT TAXA	ELMIDAE	TAXARICH	%PREDEM
303	18	Simulium	Diptera	Simuliidae	6		0	CF	0	0	0	1	18
333	2	Cricotopus	Diptera	Chironomidae	7		0	SH	0	0	0	1	2
388	37	Polypedilum	Diptera	Chironomidae	6		0	SH	0	0	0	1	37
848	11	Microcylloepus	Coleoptera	Elmidae	4		0	CG	0	0	11	1	11
271	3	Zaitzevia	Coleoptera	Elmidae	4		0	CG	0	0	3	1	3
267	1	Optioservus	Coleoptera	Elmidae	4		0	SC	0	0	1	1	1
453	1	Acari	Acari		0	11	0	PR	1	0	0	1	1
431	1	Gyraulus	Basommatophora	Planorbidae	6		0	SC	0	0	0	1	1
238	13	Helicopsyche	Trichoptera	Helicopsychidae	3		0	SC	0	1	0	1	13
384	1	Nilotanypus	Diptera	Chironomidae	6		0	PR	1	0	0	1	1
20	88	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5		0	CG	0	1	0	1	88
242	1	Leptoceridae	Trichoptera	Leptoceridae	4		0	CG	0	1	0	1	1
242	1	Leptoceridae	Trichoptera	Leptoceridae	4		0	CG	0	1	0	1	1
368	8	Orthocladius complex	Diptera	Chironomidae	6		0	CG	0	0	0	1	8
180	5	Hydroptilidae	Trichoptera	Hydroptilidae	4		0	UN	0	1	0	1	0
334	5	Cricotopus bicinctus Meigen	Diptera	Chironomidae	7		0	SH	0	0	0	1	5
338	5	Cricotopus trifascia Panzer	Diptera	Chironomidae	7		0	SH	0	0	0	1	5
906	23	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
400	1	Rheocricotopus	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
384	2	Pentaneura	Diptera	Chironomidae	6		0	PR	2	0	0	1	2
342	2	Dicrotendipes	Diptera	Chironomidae	8		0	CG	0	0	0	1	2
325	6	Cladotanytarsus	Diptera	Chironomidae	7		0	CG	0	0	0	1	6
408	6	Tanytarsus	Diptera	Chironomidae	6		0	CF	0	0	0	1	6
401	1	Rheotanytarsus	Diptera	Chironomidae	6		0	CF	0	0	0	1	1
403	3	Stempellinella	Diptera	Chironomidae	4		0	CG	0	0	0	1	3
1041	10		0	0	0	0	0	0	10	0	0	0	0
1	1	Gomphidae	Odonata	Gomphidae	1		0	PR	1	0	0	1	1
801	18	Acentrella insignificans	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	18
1051	2		0	0	0	0	0	0	2	0	0	0	0
929	8	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
18	1	Baetidae	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	1
28	4	Epeorus albertae	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	4
1065	6		0	0	0	0	0	0	6	0	0	0	0
39	2	Rhithrogena	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	2
872	6	NEW EPT TAXA ASOF 981101 5	Trichoptera		0	11	0	UN	0	1	0	1	0
638	7	Choroterpes	Ephemeroptera	Leptophlebiidae	11		0	CG	0	1	0	1	7
674	1	Psephenus	Coleoptera	Psephenidae	4		0	SC	0	0	0	1	1
6	1	Coenagrionidae	Odonata	Coenagrionidae	9		0	PR	1	0	0	1	1
927	1	NEW TAXA ASOF 981101 10		0	0	11	0	UN	0	0	0	0	0
248	140	Petrophila	Lepidoptera	Pyralidae	5		0	SC	0	0	0	1	140
198	85	Hydropsyche	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	85
1081	5		0	0	0	0	0	0	5	0	0	0	0
635	5	Hemerodromia/Chelifera	Diptera	Empididae	6		0	PR	5	0	0	1	5
383	6	Chimarra	Trichoptera	Philopotamidae	11		0	CF	0	1	0	1	6
179	1	Protoptila	Trichoptera	Glossosomatidae	1		0	SC	0	1	0	1	1
182	5	Hydroptila	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	5
1150	7		0	0	0	0	0	0	7	0	0	0	0
37	25	Tricorythodes	Ephemeroptera	Tricorythidae	5		0	CG	0	1	0	1	25
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
	546								41	18	15	40	515

TOTAL IRI	21.000	
SITE ID:		
River	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	40.0000
3	EPTRICHNESS	18.0000
5	%OOM	0.2381
5	%ELMIDAE	0.0255
3	%PREDATORS	0.0796

SCORING TABLES

taxarich	score	IBI Breakpoints
0.0000	1	<18
19.0000	3	18 - 22
22.0001	5	>22

eptrich	score	
0.0000	1	<8
8.0000	3	8 - 17
17.0001	5	>17

%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.685
0.6851	1	>0.685

%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014

%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

DRAFT: IDEQ IRI SCORE CALCULATION WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ 45 Ranch
Site ID:	
Date:	13-Jul-99

Sample Collected 99/08/15

CODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL	TEMP TOL	FFG	#Predator	EPT TAXA?	ELMIDAE?	TAXARICH	%PREDOM
601	11	Acentrella insignificans	Ephemeroptera	Baetidae	4	0	CG	0	1	0	1	11
20	153	Baetis tricaudatus Dodds	Ephemeroptera	Baetidae	5	0	CG	0	1	0	1	153
28	10	Epeorus albertae	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	10
616	31	Ephemerella infrequens/inermis	Ephemeroptera	Ephemerellidae	11	0	CG	0	1	0	1	31
35	24	Rhithrogena	Ephemeroptera	Heptageniidae	0	0	SC	0	1	0	1	24
37	23	Tricorythodes	Ephemeroptera	Tricorythidae	5	0	CG	0	1	0	1	23
128	1	Skwala	Plecoptera	Perlodidae	2	0	PR	1	1	0	1	1
235	2	Brachycentrus occidentalis	Trichoptera	Brachycentridae	1	0	CF	0	1	0	1	2
197	1	Cheumatopsyche	Trichoptera	Hydropsychidae	5	0	CF	0	1	0	1	1
593	2	Chimarra	Trichoptera	Philopotamidae	11	0	CF	0	1	0	1	2
238	11	Helicopsyche	Trichoptera	Helicopsychidae	3	0	SC	0	1	0	1	11
198	35	Hydropsyche	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	35
195	3	Hydropsychidae	Trichoptera	Hydropsychidae	4	0	CF	0	1	0	1	3
182	12	Hydroptila	Trichoptera	Hydroptilidae	6	0	SC	0	1	0	1	12
638	1	Nectopsyche	Trichoptera	Leptoceridae	3	0	UN	0	1	0	1	0
244	10	Oecetis	Trichoptera	Leptoceridae	8	0	PR	10	1	0	1	10
179	7	Protoptila	Trichoptera	Glossosomatidae	1	0	SC	0	1	0	1	7
248	6	Petrophila	Lepidoptera	Pyralidae	5	0	SC	0	0	0	1	6
846	7	Microcylloepus	Coleoptera	Elmidae	4	0	CG	0	0	7	1	7
267	2	Optioservus	Coleoptera	Elmidae	4	0	SC	0	0	2	1	2
674	9	Psephenus	Coleoptera	Psephenidae	4	0	SC	0	0	0	1	9
282	2	Blephariceridae	Diptera	Blephariceridae	0	Cold	SC	0	0	0	1	2
635	4	Hemerodromia/Chelifera	Diptera	Empididae	6	0	PR	4	0	0	1	4
303	38	Simulium	Diptera	Simuliidae	6	0	CF	0	0	0	1	38
945	1	NEW TAXA ASOF 981101 10		0	0 11	0	UN	0	0	0	0	0
329	3	Cladotanytarsus	Diptera	Chironomidae	7	0	CG	0	0	0	1	3
330	1	Conchapelopia	Diptera	Chironomidae	6	0	PR	1	0	0	1	1
339	3	Cricotopus trifascia Panzer	Diptera	Chironomidae	7	0	SH	0	0	0	1	3
348	2	Eukiefferiella brehmi	Diptera	Chironomidae	8	0	CG	0	0	0	1	2
349	1	Eukiefferiella devonica	Diptera	Chironomidae	8	0	CG	0	0	0	1	1
357	20	Lopescladius	Diptera	Chironomidae	6	0	CG	0	0	0	1	20
388	1	Orthocladius complex	Diptera	Chironomidae	6	0	CG	0	0	0	1	1
396	4	Polypedilum	Diptera	Chironomidae	6	0	SH	0	0	0	1	4
397	1	Pseudochironomus	Diptera	Chironomidae	5	0	CG	~~1~~	0	0	1	1
986	16	NEW TAXA ASOF 981101 10		0	0 11	0	UN	0	0	0	0	0
429	1	Ferrissia	Basommatophora	Ancylidae	6	0	SC	0	0	0	1	1
437	8	Fluminicola	Mesogastropoda	Hydrobiidae	5	0	SC	0	0	0	1	8
738	1	Valvata	Gastropoda	Valvatidae	8	0	SC	0	0	0	1	1
453	1	Acari	Acari		0 11	0	PR	1	0	0	1	1
			0	0	0 0	0	0	0	0	0	0	0
			0	0	0 0	0	0	0	0	0	0	0
			0	0	0 0	0	0	0	0	0	0	0
	471							17	17	9	37	481

TOTAL IRI		19.000
SITE ID:		
River	SF Owyhee River @ 45 Ranch	
Uniform Score	METRICS	Raw Score
5	TAXARICH	37.0000
3	EPTRICHNESS	17.0000
5	%DOM	0.3248
5	%ELMIDAE	0.0191
1	%PREDATORS	0.0377

SCORING TABLES

	score	ISU Breakpoints
taxarich		
0.0000	1	<19
19.0000	3	19 - 22
22.0001	5	>22
eptrich	score	
0.0000	1	<9
9.0000	3	9 - 17
17.0001	5	>17
%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.685
0.6851	1	>0.685
%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014
%predators	score	
0.0000	1	allows vlookup to calculate properly
0.0400	1	<0.040
0.0401	3	>0.040

DRAFT: IDEQ IRI SCORE CALCULATION WORKSHEET Version 3

INPUT	
River:	SF Owyhee River @ 45 Ranch
Site ID:	
Date:	24-Aug-98

T CODE	NUMBER	NAME	ORDER	FAMILY	TOL VAL		TEMP TOL	FFG	#Predator	EPTTAXA?	ELMIDAE?	TAXARICH	%PREDOM
403	6	[illegible]	Diptera	Chironomidae	4		0	CG	0	0	0	1	6
463	4	Acari	Acari		0 11		0	PR	4	0	0	1	4
608	7	NEW TAXA ABOF 981101 10		0	0	11	0	UN	0	0	0	0	0
386	33	[illegible]	Diptera	Chironomidae	6		0	SH	0	0	0	1	33
417	7	Nematoda		0	0 5		0	PA	0	0	0	1	7
401	2	[illegible]	Diptera	Chironomidae	6		0	CF	0	0	0	1	2
400	1	[illegible]	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
388	13	Orthocladius	Diptera	Chironomidae	6		0	CG	0	0	0	1	13
377	1	[illegible]	Diptera	Chironomidae	5		0	CG	0	0	0	1	1
328	6	[illegible]	Diptera	Chironomidae	7		0	CG	0	0	0	1	6
1103	1		0	0	0	6	0	0	1	0	0	0	0
1041	1		0	0	0	0	0	0	1	0	0	0	0
357	2	[illegible]	Diptera	Chironomidae	6		0	CG	0	0	0	1	2
336	11	[illegible]	Diptera	Chironomidae	7		0	SH	0	0	0	1	11
334	2	[illegible]	Diptera	Chironomidae	7		0	SH	0	0	0	1	2
333	3	[illegible]	Diptera	Chironomidae	7		0	SH	0	0	0	1	3
369	1	[illegible]	Diptera	Chironomidae	6		0	CG	0	0	0	1	1
364	2	[illegible]	Diptera	Chironomidae	6		0	PR	2	0	0	1	2
332	1	[illegible]	Diptera	Chironomidae	7		0	CG	0	0	0	1	1
781	1	[illegible]	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	1
170	14	[illegible]	Trichoptera	Glossosomatidae	6		0	SC	0	1	0	1	14
198	42	Hydropsyche	Trichoptera	Hydropsychidae	4		0	CF	0	1	0	1	42
187	12	Cheumatopsyche	Trichoptera	Hydropsychidae	5		0	CF	0	1	0	1	12
179	3	[illegible]	Trichoptera	Glossosomatidae	1		0	SC	0	1	0	1	3
1087	12		0	0	0	0	0	0	12	0	0	0	0
182	2	[illegible]	Trichoptera	Hydroptilidae	6		0	SC	0	1	0	1	2
416	1	Turbellaria		0	0 4		0	PR	1	0	0	1	1
317	3	[illegible]	Trichoptera	[illegible]	6		0	SC	0	1	0	1	3
437	6	[illegible]	[illegible]	[illegible]	6		0	SC	0	0	0	1	6
238	2	[illegible]	Trichoptera	[illegible]	3		0	SC	0	1	0	1	2
246	41	[illegible]	Lepidoptera	Pyralidae	5		0	SC	0	0	0	1	41
840	14	[illegible]	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	14
1082	6		0	0	0	0	0	0	6	0	0	0	0
801	18	[illegible]	Ephemeroptera	Baetidae	4		0	CG	0	1	0	1	18
829	28	NEW TAXA ABOF 981101 10		0	0	11	0	UN	0	0	0	0	0
29	34	[illegible]	Ephemeroptera	Baetidae	5		0	CG	0	1	0	1	34
24	3	[illegible]	Ephemeroptera	Heptageniidae	4		0	SC	0	1	0	1	3
27	2	Epeorus	Ephemeroptera	Heptageniidae	6		0	SC	0	1	0	1	2
36	21	Rhithrogena	Ephemeroptera	Heptageniidae	0		0	SC	0	1	0	1	21
1086	18		0	0	0	6	0	0	18	0	0	0	0
635	6	[illegible]	Ephemeroptera	Leptohyphidae	11		0	CG	0	1	0	1	6
57	78	Tricorythodes	Ephemeroptera	Tricorythidae	5		0	CG	0	1	0	1	78
480	1	Odonata	Odonata		0 11		0	PR	1	0	0	1	1
1	3	[illegible]	Odonata	Gomphidae	1		0	PR	3	0	0	1	3
1081	17		0	0	0	0	0	0	17	0	0	0	0
271	1	Zaitzevia	Coleoptera	Elmidae	4		0	CG	0	0	1	1	1
287	1	Optioservus	Coleoptera	Elmidae	4		0	SC	0	0	1	1	1
674	11	[illegible]	Coleoptera	[illegible]	4		0	SC	0	0	0	1	11
311	8	Atherix	Diptera	Athericidae	2		0	PR	8	0	0	1	8
288	2	[illegible]	Diptera	Tipulidae	2		0	PR	2	0	0	1	2
303	3	Simulium	Diptera	Simuliidae	6		0	CF	0	0	0	1	3
383	7	[illegible]	Trichoptera	[illegible]	11		0	CF	0	1	0	1	7
649	6	[illegible]	Coleoptera	Elmidae	4		0	CG	0	0	6	1	6
567	1	[illegible]	Pelecypoda	[illegible]	5		0	CF	0	0	0	1	1
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	0	0	0	0	0
	328								[illegible]	17	4	[illegible]	[illegible]

TOTAL IRI		21.000
SITE ID:		
River	SF Owyhee River @ Pipeline	
Unitless Score	METRICS	Raw Score
5	TAXARICH	[illegible].0000
3	EPTRICHNESS	17.0000
5	%DOM	0.1418
5	%ELMIDAE	0.0151
3	%PREDATORS	0.1836

SCORING TABLES

	score	IRI Breakpoints
taxarich		
0.0000	1	<16
16.0000	3	16 - 22
22.0001	5	>22
eptrich	score	
0.0000	1	<9
9.0000	3	9 - 17
17.0001	5	>17
%dom	score	
0.0000	5	<0.430
0.4300	3	0.430 - 0.686
0.6861	1	>0.686
%elmidae	score	
0.0000	1	<0.002
0.0020	3	0.002 - 0.014
0.0141	5	>0.014
%predators	score	
0.0000	1	[illegible]
0.0400	1	<0.040
0.0401	3	>0.040

Final Scoring of the Idaho Rivers Ecological Assessment

As demonstrated in Tables 17 and 18, cold water biota is noted supported in the South Fork of the Owyhee River at the 45 Ranch site, in Idaho. The low scores for periphyton at this site "dragged the overall assessment below the reasonable biocriterium.

Table 16. Final Tabulation of Scores for July 1999

Station	PCI Score	IRI Score	D-IBI Score	Average score
El Paso Pipeline, Nevada	5	5	5	5 "Full Support"
45 Ranch, Idaho	3	5	1	3 "Not Full Support"

Table 17. Final Tabulation of Scores for August 1999

Station	PCI Score	IRI Score	D-IBI Score	Average Score
El Paso Pipeline, Nevada	5	5	5	5 "Full Support"
45 Ranch, Idaho	3	5	Exceeds Threshold Value	"Not Full Support"

Appendix E. Photos

Figure 1. Water Diversion at 45 Ranch, September, 1999. South Fork of the Owyhee River.

Figure 2. River Below 45 Ranch Hay Fields, September, 1999. South Fork of the Owyhee River.

Figure 3. River Below 45 Ranch, September, 1999. South Fork of the Owyhee River.

Figure 4. Large Pool Below 45 Ranch, September, 1999. South Fork of the Owyhee River.

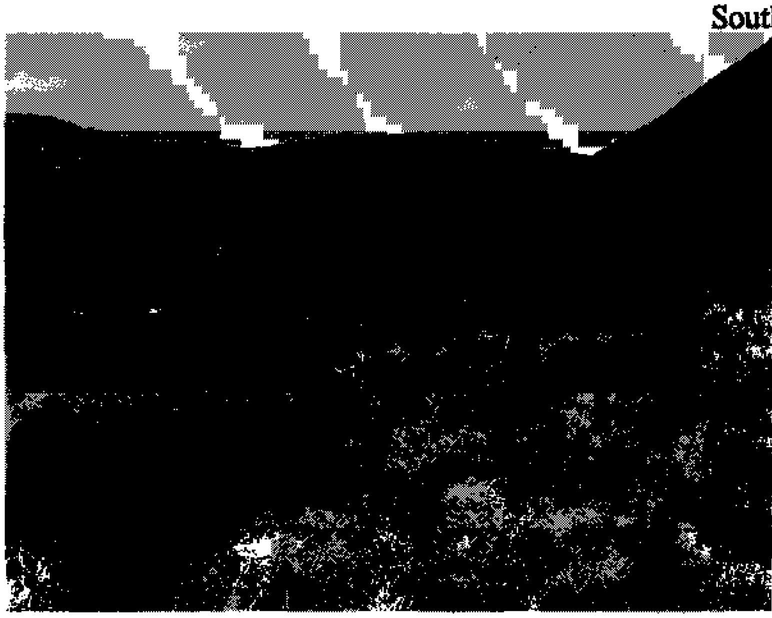


Figure 5. Bull Camp, Idaho. River Terraces. May, 1999. South Fork of the Owyhee River.

Figure 6. River Terraces near Sentenial, Idaho. May, 1999. South Fork of the Owyhee River.

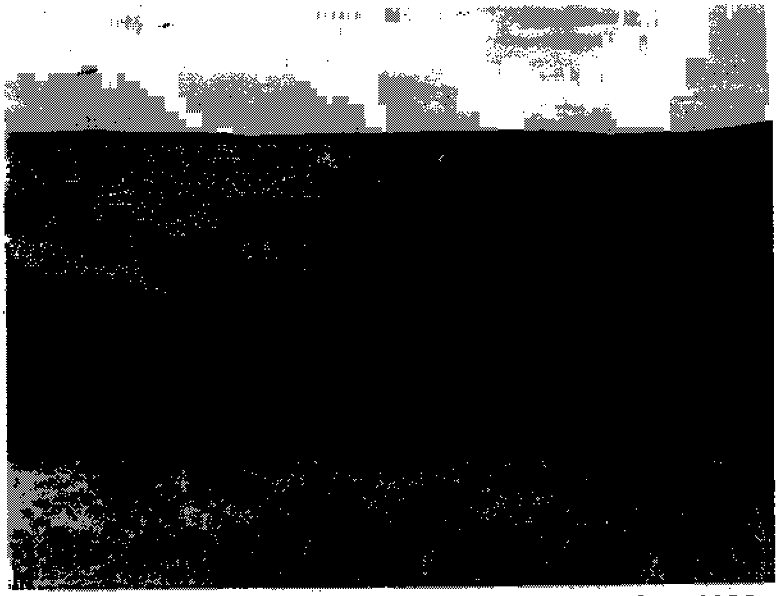


Figure 7. Canyon Area Above 45 Ranch, September, 1999. South Fork of the Owyhee River.

Figure 8. Riffle Area at the El Paso Pipeline Crossing, September, 1999. South Fork of the Owyhee River.

Figure 9. El Paso Pipeline, Eroding Bank and Depositional Area. South Fork of the Owyhee River.

Figure 10. Island Development at El Paso Pipeline. August, 1999. South Fork of the Owyhee River

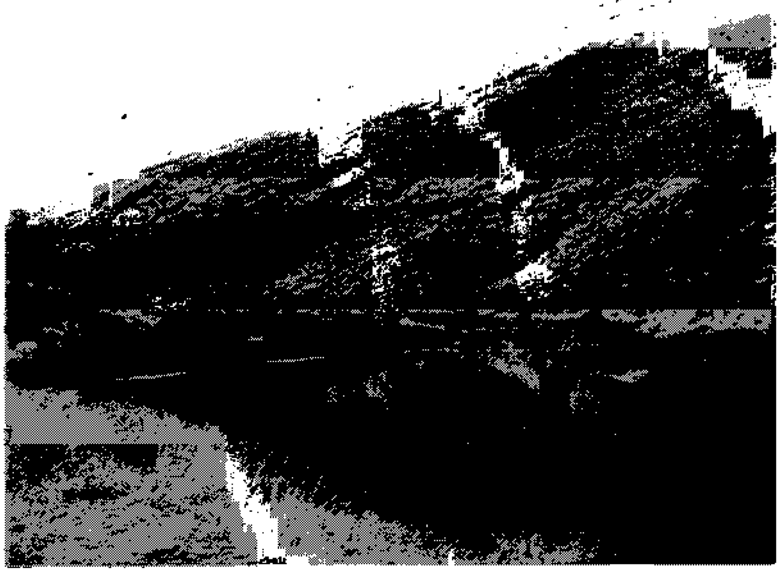


Figure 11. Riparian Area at El Paso Pipeline. August, 1999. South Fork of the Owyhee River.

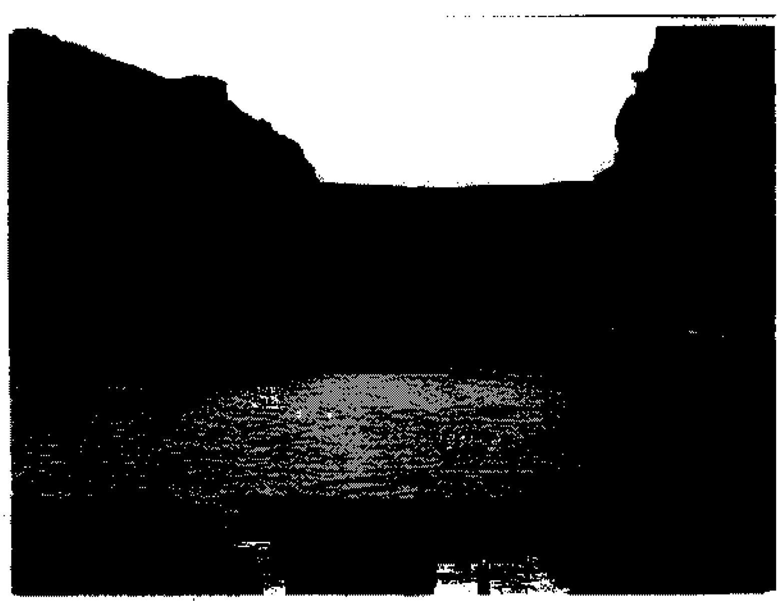


Figure 12. Canyon Area near Ida-Nev Stateline. May, 1999. South Fork of the Owyhee River.

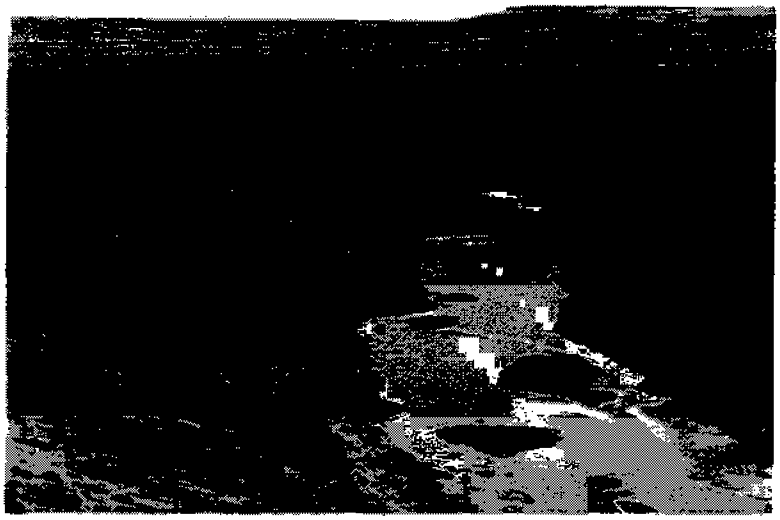
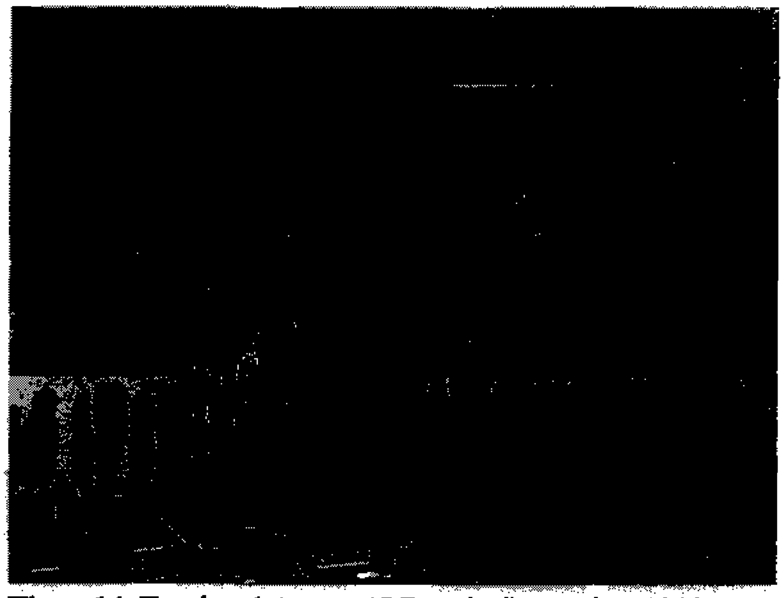


Figure 13. El Paso Pipeline Site, September, 1999. South Fork of the Owyhee River.



Figue 14. Erosional Areas, 45 Ranch, September 1999. South Fork of the Owyhee River.

Figure 15. Little Owyhee River, at Confluence with South Fork of the Owyhee River, September, 1999.

Figure 16. Riparian Area below 45 Ranch, July, 1999. South Fork of the Owyhee River.

Figure 17. Canyon Area below YP Ranch, Nevada, May, 1999. South for of the Owyhee River.

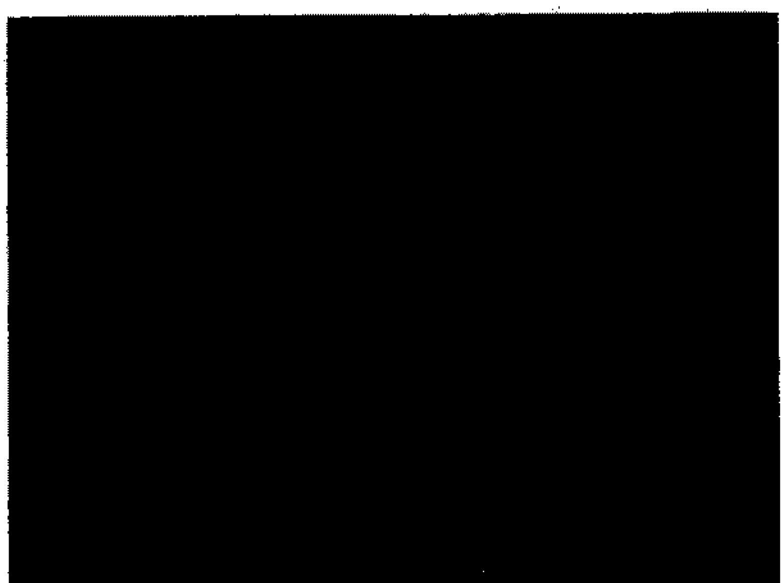


Figure 18. Riparian Area El Paso Pipeline, August, 1999. South Fork of the Owyhee River.

Appendix F. Public Comments and Responses

Jerry L. Hoagland
Seven High Ranch, Inc.

P. 2, 1.0 Executive Summary. I agree with your conclusions, "A total maximum daily load management plan is not an appropriate vehicle for addressing temperature concerns in the South Fork Owyhee River."

Response: The EPA is requiring that temperature load capacity and allocations be established for both Idaho and Nevada.

P. 9, 2.11 River Hydrology/Morphology. Because of the seasonal extreme variations of flows within this "box canyon type, with a confined river channel, and little access to a flood plain," how could you manage a nonpoint source concern, temperature, that is not a result of actions within the Idaho section of the South Fork Owyhee River, or for that matter, if Nevada was able to cool the water in the river, could the Idaho section maintain that temperature? I don't believe so. One must realize this is a "desert" stream.

Response: See above response. Section 3.0 describes load capacity and allocations for temperature. Modeling results indicate State of Idaho water quality standards can be achieved if temperature reductions are achieved in Nevada.

P. 39, 2.7 Pollutants of Concern. "Besides normal erosional runoff of sediments, the irrigation induced erosion of the agricultural areas may also be a significant source. To what extent these agricultural areas contribute to the overall sediment increase to the South Fork Owyhee River is not known at this time." Your suggestion that sources of sediments in the upper reaches of the River in Nevada may contribute to the overall pollution of the South Fork Owyhee River is not appropriate for this claim. USDA-ARS-NWRC at Boise, Idaho, has extensive sedimentation studies of similar agricultural practices and of grazing and non-grazing rangelands at Reynolds Creek, Owyhee County, Idaho. The information from those studies should be reviewed before making statements directed at Nevada ranch practices.

Response: It has been stated in other studies (Mosely, 1999) that the source of sediments in the South Fork Owyhee River is associated with the agricultural practices in Nevada. The SBA-TMDL also states the extent of the sediment is not fully understood. Further evaluation in Nevada is needed. If data is available to demonstrate that sediment is not originating from agricultural lands, this will be examined during the development of an assessment in Nevada.

Daryl Albiston, Owyhee Field Manager
BLM/Lower Snake River District

P.1 Executive Summary. Paragraph 4, sentence 2. "State of Idaho lands," more appropriate? The 45 Ranch is at a confluence with Little Owyhee River.
Last sentence Suggest Grazing of livestock began in the late 800's.

Response: The reference to State of Idaho school endowment lands is appropriate and will remain. The State of Idaho has designated lands that are managed by the State as school endowment lands with proceeds from activity on those lands earmarked for Idaho's schools.

The sentence will be changed to reflect that the 45 Ranch is 13 miles upstream from the confluence of the East Fork

The last sentence will read "with livestock grazing beginning in late 1800's."

P.2. Paragraph 2 suggest rewriting.
Paragraph 5 sentence 3 suggest rewriting, "...understood if Redband trout (the subspecies of rainbow trout found in the Owyhee Deserts streams and rivers) would utilize... "
The last paragraph is river morphology at site potential?
Is water quality required to meet Idaho standards at the Idaho/Nevada state line?

Response: Suggestion is noted.

The reference to Redband trout will be rewritten.

The last paragraph has been rewritten to incorporate a TMDL for temperature.

The State of Nevada is required under the clean Water Act to achieve Idaho water quality standards.

P.14 Section 2.1.4. If Redband trout were confirmed to be seasonally present, would that change anything (i.e., water temperatures are at the upper limit of what trout tolerate)? Given the size of the stream it is not likely that they would stay in the S.F. as temperatures increase?

Response: State of Idaho water quality standards would have to be modified to incorporate seasonal variability.

P.14 Paragraph 4. Not clear what this means. BLM does not have a designation like this. However, Redband trout, has been designated as a special status species.

Response: Map on page M-35 of the Owyhee Resources Area RMP was misread. Reference to the Special Status for Redband trout will be removed from the SBA-TMDL.

P.15 Paragraph 1 contains misspellings.

Response: Appropriate changes will be made.

P.19 Paragraph 6, rewrite the last sentence.
Paragraph 7 needs to be rewritten.

Response: We feel the sentence in paragraph 6 is appropriate.

We feel the sentence in paragraph 7 is appropriate.

P.21 Section 2.3.6. Reference temperature data should use either tables or figures rather than rough data in Appendix A.
Section 2.3.7, is the same as 2.3.6.

Response: Temperature data is referenced later in the Sec. 2.7 under discussion of Pollutants of Concern.

P.22 Paragraph 1 has misspellings.
Section 2.3. Includes data that should be in 2.4, or not mentioned until section 2.4?

Response: Appropriate changes will be made.

Section 2.4, relates how the available information will be used. Further discussion of data as it relates to beneficial use support is in Section 2.5.

P.24 Table 10 in text refers to temperature. Table 10, is fish captured.

Response: Appropriate changes will be made.

P.26 Paragraph 6, last sentence, biomass - didn't Allen etal. Sample additional fish species?
In the last paragraph the word succors should be suckers.
What species of Sculpin is referred?

Response: Similar species were found in the 1995 and 1996 studies. The emphasis is that no trout species were found in either study. Sculpin species has been determined to be *Cottus bairdi (Mottled Sculpin).*

Appropriate changes will be made.

P.27 Turbidity was not measured during runoff.

Response: Samples were collected during the backside of the hydrograph (May 1999). Samples were not collected during runoff, and this is one of the data gaps identified.

P.28 Section 2.6.4 contains misspellings.

Response: Appropriate changes will be made.

P.30 Paragraph 3. The last sentence needs to be rewritten.
Section 2.7.1 is similar to that already in Section 2.4.2. Could these be combined?

Response: Appropriate changes will be made.

Section 2.7.1 goes into greater detail on the Pollutants of Concern and describes the impacts to the beneficial uses and to what extent State water quality standards are exceeded. Section 2.4.2. describes how data is to be used.

P.31 In paragraph 5 the S-N aspect statement is not consistent with Paragraph 3.P.

Response: Page 34 is in reference to a study completed in Oregon, where it was found that rivers with an east-west aspect had warmer water temperatures than those with a north-south aspect. This may indicate that exposure duration is longer in east-west systems. The South Fork Owyhee River does have mainly north-south exposure, further analysis of other rivers with an east-west aspect (East Fork Owyhee River) would assist to determine if the Oregon study would apply to these rivers. The South Fork is wide open for solar radiation input, but it is not clear if the duration of exposure is the same as those systems with an east-west exposure.

P.33 In Figure 10 it is difficult to discern between 2-sample sites. Recommend giving a figure of max/min's, and another table of daily averages.

Response: The graph has been changed.

Further graphing of data is located in Appendix A.

P.36 Sigler etal. The 1984 citation is not listed in the literature cited section.

Response: Appropriate changes will be made.

P.39 Paragraph 1. Mid-river islands/depositional areas indicate the river has more sediment than it can handle. Did DEQ have a Fluvial Hydrologist look at this system? Are there eroding banks for 100's of meters? Yet, it was stated that the system is in equilibrium. A survey of % streambank stability might be helpful.

Response: Ideally more information should have been collected and more analysis completed on the South Fork Owyhee River. However, due to the limited time frame for completion of the SBA and TMDL, limited information had to be utilized to make beneficial use support status calls. If the BLM wishes to provide additional information on beneficial use support status as related to streambank stability, an amendment to the SBA-TMDL can be incorporated into the SBA-TMDL at a later date.

There are no conclusions, except for the only one given in the last paragraph of the Executive Summary.

Response: A subsection will be added at the end of Section 2.9 with an overall conclusion.

Shouldn't Nevada deliver water that meets (or comes as close as possible to) Idaho standards?

Response: A temperature TMDL has been developed with temperature capacity and allocations and is incorporated into Section 3.0.

Based on the description of the South Fork geomorphology provided it is not clear that the system is at site potential.

Response: It is not within the scope of this document to determine site potential. This document is designed to determine beneficial use support and also address listed Pollutants of Concern.

There is probably a historic heavy load of sediment. Has the stream flushed it yet?

Response: It is not within the scope of this document to determine hydrologic conditions of the South Fork Owyhee River. It is speculated that the South Fork Owyhee River is a transport system. If information is available to show that there is a historic heavy load of sediment and this load is impairing beneficial use then an amendment to the SBA-TMDL can be added to this document. It is still speculated that the South Fork Owyhee River is in equilibrium, with a majority of the sediment (both suspended and bedload) associated with spring runoff.

Mid channel bars cause increased erosion forces on banks which result in bank washing.

Response: It is not within the scope of this document to determine hydrologic conditions of the South Fork Owyhee River. It is speculated that the South Fork Owyhee River is a transport system. If information is available to show that there is a historic heavy load of sediment and this load is impairing beneficial use an amendment to the SBA-TMDL can be added to this document. It is still speculated that the South Fork Owyhee River is in equilibrium, with a majority of the sediment (both suspended and bedload) associated with spring runoff.

The sediment/stream morphology issue might indicate the need for a hydrologic study.

Response: Agreed, if a hydrologic study is developed, it can be added as an amendment to this document.

BLM has large scale aerial photos of the S.F. Owyhee taken in 1998-99, and has conducted a function condition assessment of the Idaho reach. Results of that assessment indicate the stream is Functioning at Risk with no apparent trend.

Response: The State of Idaho does not recognize PFC as an indicator of beneficial use support.

Katie Fite
Committee for Idaho's High Desert

Mike Medberry
American Lands Alliance

1. In the Draft Assessment, DEQ wrongly walks away from serious water quality problems that must be addressed. Despite finding temperature accedences over an extended period of time, DEQ fails to prepare a TMDL for temperature. DEQ analysis of sediment is limited by lack of data. DEQ never sampled bacteria. DEQ downplays recreational significance of the South Fork, and does not examine impairment of aesthetics.

   Response: A temperature load capacity and allocation have been developed and incorporated into Section 3.0. The limited sediment data available did not indicate that State of Idaho water quality standards were exceeded for sediments. The bacteria results are located in Table 8. There are no numeric or narrative standards to compare and determine aesthetic quality, nor has the DEQ-Boise Regional Office received complaints concerning the aesthetic quality of the South Fork Owyhee River.

<u>Sediment</u>

DEQ did not measure sediment at a time of year when the River bears most of its sediment and nutrient load. DEQ's sediment work is a one point in time, look. There is no examination of sediments during many periods of biological importance for aquatic organisms - including cold water fish and mussels. DEQ has not collected sufficient data to determine whether a TMDL for sediment is required. DEQ must measure the suspended and bedload sediment during periods of high water. Sediments impair cold water species and suspended sediments impair feeding, aggravate gills, and reduce oxygen intake by fish. Bedload sediments disturb macro invertebrate habitat, and fill pools.

Response: Available data did not indicate that State of Idaho water quality standards were exceeded for sediments. Independent analysis and interpretation of periphyton data did not conclude sediment was impairing aquatic life in the South Fork Owyhee River within Idaho (Appendix C.) It is recognized that a data gap exists that more information on pool frequency and pool quality is not available.

P.2 In the SBA/TMDL, DEQ, in sidestepping the sediment issue, repeatedly refers to substrates "appearing" good. How was this good appearance assessed? DEQ also collected only "limited" turbidity data - at one point in time. A range of quantitative data is lacking.

Response: The areas where substrate information was obtained did not indicate that sediments (% fines) were embedding the substrate in quantities that would impair beneficial use support. Other studies (Allen, 1996) also indicated that sediments were not at levels that would impair beneficial use support. The term "appears" is utilized in this document as a level of confidence with the evaluations made.

P.26 Waters of the South Fork Owyhee are murky and discolored. The surface in slack water in late summer is often coated with algal scum. Periphyton assessment was conducted using standards and indices that may not be applicable to desert waters of the Interior Columbia Basin. We have repeatedly noticed that the waters of the South Fork Owyhee River have a murky appearance, and substrates are coated with algae and/or sediments. Periphyton scores indicated degradation and "Not Full Support" of cold water aquatic life, yet DEQ proposes no action to address this impairment.

Response: Nutrients that may be associated with the "scum" identified are not listed as pollutants of concern in the 303(d) list. Low water flow quality data (Appendix A) did not indicate that nutrients were at levels that may impair beneficial uses. However, it should be noted that high nutrient levels were found in May and June at the Nevada and Idaho sites. Nutrient levels dropped to levels below any recommend criteria for July, August and September. There is no indication that sediments are impairing the beneficial uses. The independent study submitted by Dr. Bahls (Appendix C) showed that the species present were sediment intolerant. The use of the Large River's assessment is still in draft form. The use of pariphyton information collected and identified by Dr. Bahls showed that some of the species found in the South Fork Owyhee River were not included in the indices used to calculate Idaho's D-IBI. As more information is collected on Idaho rivers, especially in the High Desert Ecoregion, the assemblages used in the D-IBI will become more refined.

P.37 It is impossible to understand DEQ's discussion of turbidity which discusses colloidal material suspended in the water, but notes "that would also indicate the eroding riverbanks noted along the Nevada and Idaho sections were not contributing to the overall turbidity." What is meant by this? Also, DEQ measured turbidity during periods of low flow -- not during periods of runoff or after rainfall events when effects of bank erosion and other sediment sources would be greatest.

Response: Table 12 shows the turbidity results for 1999. Turbidity samples were collected in May 1999 at 7 sites during that period. Turbidity samples did not increase from the up-river sites to the down-river sites during that period. This would indicate that the material within the water column did not "pick up" additional material. This is more heightened by the fact that no other tributaries were flowing in Idaho.

It is also impossible to understand what the Macroinvertebrate data means. Although the SBA contains an Appendix with long lists of species in small print, how was analysis done? What were reference areas? What impairment do the results show?

Response: Macroinvertebrates analysis is explained in Sec 2.4.3.

<u>Bacteria:</u>

There is no mention of bacteria in the SBA. DEQ failed to conduct necessary sampling for bacterial pollution of great importance to recreationists who use the waters of the South Fork.

Response: Please refer to Table 8, Sec 2.3.8.

<u>Geographic Omissions:</u>

DEQ cannot ignore the influence of the Little Owyhee watershed. We ask that DEQ review USGS 1:250,000 maps that depict this very large watershed. Calico, Raven, Lake, and Tent Creeks in Nevada all are tributaries to the Little Owyhee. We are puzzled by the map accompanying the TMDL. Why were the Little Owyhee and intermittent draws tributary to the South Fork downstream from its confluence with the Little Owyhee not included in the SBA/TMDL?

Response: The Little Owyhee River is a separate 4th Order HUC and is not listed as a "Water Quality Limited Segment." At the time of monitoring, the Little Owyhee River had little or no flow into the South Fork Owyhee River. The lack of water makes the assessment of any water body for comparison to water quality standards impossible. The Little Owyhee River has been incorporated into all GIS coverage for reference only.

Impacts of grazing are ignored:

Severely over-grazed public lands span watersheds in a tri-state area tributary to the South Fork. Following in BLM's steps, DEQ demonstrates a reluctance to tangle with the multi-millionaire public lands ranchers and others who control upstream private lands in Nevada, as well as graze significant portions of public lands in the South Fork country in Idaho and Nevada.

Response: The scope of this document is to evaluate water quality information and determine support status for designated beneficial uses, and to develop a TMDL to achieve State of Idaho water quality standrads.

DEQ claims that livestock do not use the river in Idaho, and seems to think that Nature Conservancy ownership of the 45 Ranch further absolves it from taking a look at livestock problems in Idaho. DEQ is wrong on both accounts. We have hiked the canyons of the South Fork, while herds of cattle ran bellowing in front of us, kicking up dust from uplands, and further damaging over-grazed stream banks. Rafters on the South Fork in Idaho in spring of 1999 observed significant cattle use in the riparian corridor. In addition, the Nature Conservancy continues to graze livestock in the South Fork watershed. The ranch manager was "busted" by BLM this year for illegally running his own cattle, in excess of numbers permitted legally to graze. As long as the Nature Conservancy continues to graze these lands, activities such as this may occur.

Response: The scope of this document is to evaluate water quality information and determine support status for designated beneficial uses, and to develop a TMDL to achieve State of Idaho water quality standrads.

Temperature:

DEQ found temperatures that exceeded State of Idaho standards on 65% of monitoring dates.

Response: Agreed

DEQ notes that WQI scores were lower at the 45 Ranch than at the El Paso pipeline. This indicates that additional impairment, beyond that stemming from Nevada, is occurring in Idaho. (El Paso - a good rating, 45 Ranch - a poor rating.)

Response: The data presented in Appendix A is an indication that the largest contribution to lower water quality index (WQI) scores at the 45 Ranch is associated with increased water temperatures. This is further evaluated by the continued temperature results showing higher average water temperatures than those at the Nevada site.

Aesthetics:

DEQ must prepare a TMDL for aesthetics. The South Fork Owyhee River WSSA includes 44,955 acres of land in Idaho. Management of the WSA must not impair the land's suitability for designation as wilderness. DEQ's role is to be honest in its assessments of water quality parameters, collect adequate data, and provide reasonable analysis that can be acted upon to bring about changes that ensure compliance with water quality laws. This action is in the publics interest.

Response: The State of Idaho does not recognize aesthetics as an acceptable candidate for a total maximum daily load.

Under FLPMA, BLM was mandated to inventory its lands. BLM's evaluation of the South Fork WSA's suitability for wilderness focused on criteria of Naturalness, Solitude, Primitive and Unconfined Recreation, and Special Features. In BLM's 1991 Idaho Wilderness Study Report (IWSR) Volume 1, BLM's evaluation of these criteria and its recommendation of the South Fork WSA as suitable for wilderness, states on pps. 179-194: "Naturalness: "Wildlife within the WSA includes California bighorn sheep, mule deer, pronghorn, mountain lion, bobcat, coyote, river otter, beaver, raptors, waterfowl, chuckars, other birds and Redband trout." "The scenic natural features...attract people interested in hunting, backpacking, river running, and other activities such as...fishing. River running opportunities on the South Fork are of exceptionally high quality." "Floating or hiking along the river or its tributary streams gives a sense of participation in a natural force"... Also, p. 184: "Special Features: "sensitive wildlife species include...river otter and Redband trout."

Response: The State of Idaho does not recognize aesthetics as an acceptable candidate for a total maximum daily load. If data is available that demonstrates water quality does not support wildlife, the SBA-TMDL will be amended.

Today, Redband trout have disappeared from the South Fork in Idaho. We also note that BLM was concerned about sediment loads, even in the 1991 IS. reports: See p. 190 where impacts of Alternatives on sediment loads are discussed.

Response: Through data evaluation it was determined the South Fork Owyhee River is in equilibrium, with a majority of the sediment (both suspended and bedload) associated with spring runoff. It was not shown that sediment was impairing beneficial uses or exceeding State of Idaho water quality standards.

In addition, in its evaluation of the Owyhee Canyon WSA in Nevada, BLM in the ISR. cites values of Naturalness: "Redband trout," Primitive and unconfined recreation: "wildlife viewing, fishing," etc.

BLM's evaluation of the South Fork included numerous elements associated with, and impacted by water quality.

The public interest is poorly served by DEQ's attempt to downplay the extraordinary values of the South Fork Owyhee. DEQ's report on p. 15 states that: "recreation opportunities (on the South Fork) are limited" by its "remoteness." This is a clear misrepresentation of the truth. Recreationists avidly seek the South Fork for white water experience! BLM's documents, readily available to DEQ, show the extent of the values of national significance that DEQ has overlooked in its incomplete and insufficient analysis in the SBA.

Response: See Table 8 for water quality concerns of the support of recreational use.

Redband trout have disappeared from the South Fork Owyhee - since BLM wrote its WSA analysis in 1991. Just 7 years ago, we too recall seeing Redband trout in the South Fork in Idaho. Consultants hired by the Air Force for preparation of the aborted ITR Bombing Range effort, noted Redband trout in the South Fork. Yet, during stream survey work of IDFG in 1996, no Redband trout were found. Katie Fite of CIHD participated in this stream survey, and recalls the murky brown-green water as well as slippery, algae-coated rocks.

BLM in the Proposed Owyhee RMP recommends the South Fork Owyhee River as Wild and Scenic River, and assesses its Outstandingly Remarkable Values. PRMP, Vol. 2, Appendix RECT-3, pps. A-207 to A-217. BLM finds the South Fork to "offer outstandingly remarkable float boating opportunities...along its entire length." "The entire South Fork Owyhee River segment offers a canyon landscape of diverse land forms, vegetation and water that possess scenic qualities of outstandingly remarkable value."

Response: Agreed.

Under fisheries, BLM notes: "Fisheries habitat in the South Fork Owyhee...is presently judged to be in unsatisfactorily (fair to poor) condition overall because of stream siltation, low summer flows, high water temperature, and the lack of cover."

The SBA p.14 states: "the South Fork Owyhee River is a special status area for Redband trout (BLM 1999)." DEQ cannot brush aside its responsibilities to ensure adequate habitat for trout and other aquatic species. DEQ cannot walk away polluted, troutless waters in Idaho by pointing elsewhere. DEQ claims that Idaho's problems come from Nevada. We do not believe this is completely the case.

Response: If further data becomes available that demonstrates that the assessment pertaining to habitats is found unacceptable, an amendment to the SBA-TMDL will be made.

DEQ fails to consider a wide array of cold water biota that could potentially inhabit the South Fork. During our work on public lands grazing we have reviewed Elko BLM documents for the YP allotment that discuss the South Fork as a location of the California floater, a rare and declining freshwater mussel. DEQ provides no data or mention of this species.

Response: Comments noted.

Even if it were true that Idaho's problems come form upstream in Nevada DEQ must work to restore this current salmonidless river system. DEQ should commit to working jointly with NV (and also Oregon-Little Owyhee) to change water quality conditions. DEQ has shown temperature impairment, and now must act to clean up livestock-damaged and polluted waters.

Response: If resources are available, the State of Idaho will assist the State of Nevada in their assessment of the South Fork of the Owyhee River in Nevada.

The Draft SBA must be withdrawn. DEQ must start over, and conduct a comprehensive look at Clean Water Act violations on the South Fork---a look that is based on scientifically sound methods and collection of a range of quantitative data. DEQ must also commit to working jointly with Nevada (and Oregon) to clean up these waters.

Response: Comments noted.

DEQ must collect data sufficient to prepare TMDLs for aesthetics, sediment, and bacteria. Only by collecting such data can DEQ determine degree of impairment of beneficial uses, and whether TMDLs must be done. DEQ's temperature data for 1999 clearly show that a TMDL must be prepared, perhaps as a joint undertaking between

Idaho, Nevada, and possibly Oregon.

Response: Aesthetics are noted to be an acceptable candidate for a TMDL. Bacteria data (Table 8) did not indicate that contact recreation was notimpaired. Data collected in 1999 and the limited historical data did not indicate that sediments were impairing beneficial, nor did data collected show that the State of Idaho water quality standards were exceeded.

Please also incorporate applicable portions of our comments on the North and Middle Fork Owyhee SBA/TMDL here.

The Committee of Idaho's High Desert (CIHD) and American Lands Alliance (ALA) are submitting the following comments on the North and Middle Fork Owyhee Subbasin Assessment and Total Maximum Daily Load.

DEQ has erred in its failure to develop TMDLs for Sediment, Bacteria and Aesthetics in the Middle and North Fork Owyhee subbasins. DEQ inadequately sampled the North and Middle Fork Owyhee for bacteria and sediment, and misled the public in its interpretation of limited Macroinvertebrate data. DEQ fails to discuss aquatic life such as rare or declining species of mussels or spotted frogs. Most disturbingly, DEQ fails to address impaired Aesthetics in these wild land waters with extraordinary values to the public---values that are of national significance.

Specific Comments:

DEQ based its decision not to do TMDLs for sediment on "available data," but DEQ simply did not make an effort to acquire data on sediment necessary to make a reasoned decision on preparation of a TMDL for sediment. DEQ failed to collect a range of data at a number of locations during various times of year, including periods of importance to life histories of aquatic species. DEQ did not use a sufficient range of techniques in its assessment of sediment.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ cites having "no data" --- that is precisely because DEQ failed to collect sufficient data at a range of stream locations. For example, the headwaters of the Middle Fork of the Owyhee River are grossly muddied and polluted by livestock trampling activity and livestock wastes. The entire watershed is an ecological shambles. CIHD and ALA repeatedly told DEQ that any assessment of water quality parameters in this subbasin must include a range of samples taken here. We met with DEQ staff and showed them photos of this area. Yet, DEQ never even visited this site.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ's Executive Summary concludes that "Biological indicators...meet Idaho's requirements for full support. In other words, there is no data at this time that shows specific impacts to aquatic life from the current sediment load." Stationery, anchored aquatic life forms such as mussels would be most susceptible to sediment impacts. Mobile species such as fish may find scarce micro sites in the system to escape sediment impacts. Mobile species such as fish may find scarce microsites in the system to escape sediment impacts. DEQ on page 3 says "therefore, there can be no increase in current beneficial uses." DEQ has gathered insufficient information to serve as a baseline for assessing sediment, so there is no basis for any future comparison. This is a meaningless promise. Quantitative data are required.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Although "...EPA does not require flow and habitat alteration to be addressed as a TMDL pollutant," DEQ could prudently assess this. Without an adequate habitat, aquatic species impaired, and beneficial uses impaired and not fully supported.

DEQ only collected data on bacteria at one location on the North Fork Owyhee River during two months. DEQ fails to say if livestock were grazing the area when the data collected occurred. If the samples were collected in the North Fork Campground, this is an area that is closed to all livestock grazing, and it is certainly not representative of the water quality conditions on the remaining 99.9% of the streams in the TMDL analysis area. If samples were collected upstream from the road crossing, it is our observation that this area is not normally grazed during the time period when DEQ took samples.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

BLM shows that during periods of livestock grazing, bacteria levels often peak. To accurately reflect conditions in waters, DEQ must collect samples during periods when livestock are present and also during runoff periods when large amounts of livestock waste are flushed into streams. DEQ did not do this.

Response: Table 8 shows the bacteria data collected in 1999.

DEQ p. 3: "... and overall loss in living space may be... the result of either nearby habitat and flow alteration or an excessive sediment load that results in pool filling..." DEQ plans on monitoring pool quality within the lower reaches of the North and Middle Fork Owyhee Rivers." This is not adequate. This TMDL process for sediment, nutrients and aesthetics cannot be complete until data is collected from representative reaches of streams. DEQ will not have taken a hard look at water pollution and impaired uses in these watersheds until a TMDL process for sediment, bacteria, and aesthetics is undertaken.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Table 6 on page 17 provides "percent of BLM Acres with High Erosion." This shows that 39% of the acres in the Cliffs allotment, which includes portions of Juniper, Cabin, Corral, Noon Creeks and the North Fork Owyhee River, have high erosion potential. In addition the Cliffs, Pole Creek, and Trout Springs allotment are perennially over-grazed. BLM stubble height criteria fail to be met year after year. Uplands contain large areas of bare soil where sheet erosion is occurring, and desirable perennial native species such as Idaho fescue are being replaced by Poa bulbosa, a very poor soil stabilizer, and weedy annuals. Any possible BMP loop to protect habitat or water quality is not working.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ fails to adequately describe the Existing Environment. Page 21 provides AUM information, but fails to provide any information on the repeated failures of livestock grazing to meet even modest standards of BLM.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ cites "a reduction in beaver activity as a reason for stream channel down cutting and entrenchment," and cites an IDL report. While beavers have disappeared from large areas of these drainages, their continued absence today is due primarily to lack of riparian habitats that is caused by unrelenting over-grazing. This damage to upland and riparian habitats is not just historic, but is caused by continued **over-grazing.** This overwhelming cause of habitat loss is clear to anyone who sets a foot on the ground in the Middle and North Fork Owyhee watersheds.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Table 1: DEQ failed to collect data from Soldier, Pole and Field Creek. Pole Creek is grossly overgrazed by livestock, and typically has the lowest stubble heights of any stream in the Owyhee Resource Area. DEQ must designate beneficial uses for these streams, and collect data on sediment, bacteria, temperature, aesthetics, and habitat parameters.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Table 3: DEQ's 1998 303d List errs in not listing bacteria as a Pollutant of Concern in all Water Bodies. It errs in not listing Impaired Aesthetics as a Pollutant/Issue of Concern in all water bodies in these subbasins.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Figure 2 indicates that Pole Creek and other drainages were not included in the 1998 303d List. This is a gross oversight. Pole Creek is severely degraded by livestock --- with significant impairment of all beneficial uses.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Page 25 states: "Most of the listed water bodies...are fed by springs, seeps, and upland wet meadows...located at higher elevations." These areas are not contained in deep canyons, and are readily accessible to livestock. All such sites (outside of a handful of exclosures) that we have visited in these drainages are severely grazed and trampled, and their banks and water are fouled by large amounts of livestock waste. In addition, hummocking, and damage to riparian plants is causing these springs, seeps and wet meadows to shrink dramatically in size --- resulting in habitat loss, substantial decreases in watershed storage, and loss of significant amounts of cooler, more slowly released water to the drainage system. Yet, DEQ failed to even sample these sites, such as the Middle Fork of the Owyhee River. There is no indication that DEQ visited the 6-foot headcut just below the tiny remnant wet meadow at the head of Big Spring Creek inside a BLM exclosure that is routinely trespassed. The remnant Big Springs wet meadow/spring area, is the best example of this habitat type that remains in the SBA area.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Page 27-28 analysis of loss of flood plains and channel entrenchment is misleading in focusing overly on loss of beavers, and historic factors. Historic and ongoing livestock grazing are so clearly evident to anyone who visits these watersheds. DEQ must be honest and recognize this. No valid scientific assessment of water quality can occur until DEQ honestly recognizes this. No restoration and maintenance of the chemical, physical and biological integrity of these waters can occur until this is done.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Page 31: "No more than a ten percent increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity." Throughout the grazing period (June-October) on these streams, cattle concentrate on riparian areas, stand and defecate in and along streams, causing significant water turbidity problems. DEQ does not discuss this. DEQ presents no data on background/baseline turbidity.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Maps: Although some maps are attached to Appendices, it is not clear if each sample sites are the same for all parameters that could influence data --- were samples taken inside the canyon a steep-walled canyon inaccessible to livestock, or in an open area/ Were livestock present when sample was collected? Etc. The sampling environment must be adequately described.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

P. 44. Sediment data: DEQ states that: "the high percent of fines measured (Table 20) do not, in and of themselves, indicate an excessive amount of sediment under the narrative sediment standard," because salmonid spawning was found in several streams. DEQ fails to address impairment of spawning, and other life stages. Certainly, there may be small areas within canyon portions inaccessible to livestock where spawning may occur, but DEQ has no grounds for saying that spawning may not be impaired, when faced with data of high percent fines, and visual appearance of habitats.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Occurrence of salmonid spawning does not mean that the narrative sediment standard is not being violated. Data in Table 20 provides convincing evidence that DEQ must prepare a TMDL for sediment, and cannot escape with a thin of sketchy future monitoring, as is proposed.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ draws false conclusions, and ignores its own data in discussions of macroinvertebrate species on p. 46. Appendix C. Macroinvertebrate data shows:

* Cabin Creek - Cold water indicators were not found.
* Corral Creek - (D)ata shows a significant disturbance in assemblage composition.
* Juniper Creek - Too few organisms in the June sample; no cold water indicators in June or August samples.
* Pleasant Valley Creek - Too few organisms in the June sample. No cold water indicators in the August sample.
* Squaw Creek - (S)ite is moderately to heavily impacted. No cold water indicators in August. Only 1 of 452 organisms in June (possibly) a cold water indicator.
* **Middle Fork Owyhee River - No cold water organisms found.**
* **North Fork Owyhee River - No cold water organisms found.**
* Big Springs Creek - Most organisms are tolerant of disturbance.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Report in Appendix C cites DEQ's protocols that sample collections should consist of a minimum of three samples! ---This apparently was not done in the development of this

SBA/TMDL report, and renders any positive conclusions about macroinvertebrates being ok scientifically invalid. In addition, DEQ's macroinvertebrate assessments lack reference conditions, do not describe or contain rationales for selection criteria for monitoring stations, or frequency of monitoring.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ misleads the public in its description and analysis of macroinvertebrate data. It is impossible for a reasonable person to understand how DEQ arrives at statements such as p. 46 "Macroinvertebrate species collected at each of the listed water bodies shows that, while most of the species presents tolerate disturbances, most of the samples have good total abundance, taxa richness, and species that are generally associated with good water quality conditions, including cold water." In reality, an examination of Appendix C shows that such conclusions simply cannot be drawn. The statement that "overall review of these data indicate that each site monitored reflects minimal impacts within an arid system" is clearly not valid.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

By no stretch of the imagination can the macroinvertebrate data be said to show "minimally impacted" sites, as DEQ claims on p. 49. DEQ cannot even follow its own protocols in collecting samples.

Here, as in its South Fork Owyhee SBA/TMDL, DEQ masks impacts and paints a make-believe picture.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

The upper portions of drainage such as Noon Creek in the Cliffs allotment were scheduled for complete rest from livestock this year, due to extreme degradation by livestock. So, samples are not representative of actual on-the-ground conditions in years when areas are grazed. The impact conclusions of the report writer in Appendix C must be interpreted/related to livestock grazing - cattle presence - vs. rested areas.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

For well over a decade, the Cliffs allotment has been known to be an ecological disaster, but BLM has been unable to make on-the-ground changes due to political pressures from livestock interests. We ask that DEQ review data in BLM's grazing and riparian files for the Cliffs and other allotments, and honestly present this data as part of the TMDL analysis. Ongoing habitat loss is occurring as futile attempts to stabilize eroding stream banks with no-eroding juniper rip-rap show.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Temperature criteria that protect only a single salmonid stage (spawning) are inadequate. State criteria and TMDLs must protect all life stages of salmonids if beneficial uses are to be protected.

Response: Comment noted.

Reductions in thermal loads should be established for Big Spring and Squaw Creeks.

PFC is highly subjective. The PFC assessment cited by DEQ was done by IDL under the usual political pressure to uphold continued extractive use by livestock permittees on leased state lands, and to thwart conservationists from acquiring state leases. Idaho Watersheds Project had submitted competing lease applications for these lands in 1999, and this prompted preparation of the IDL document. A report done by IDL in this context must be viewed with skepticism.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

The PFC study that BLM paid Consultants from Montana to conduct is highly suspect, since consultants surveyed more than 100 sections of stream, and found none to be non-functioning. The Consultants begin their report with a disclaimer, saying that they hesitate to call any stream nonfunctional. In addition, the Consultants appear to be very unfamiliar with the high desert stream environment and processes --- the beginning of the BLM PFC report contains a photo of high water debris in riparian vegetation in Deep Creek, and interprets the debris as the result of thunderstorm events. Deep Creek is renowned among white water recreationists for being an early spring high water stream, with a very brief window of floating opportunity. Spring snowmelt runoff events, not thunderstorms, deposit head-high debris in streams such as Deep Creek. Such bias and hesitancy to call any stream, no matter how bad the condition, "non-functioning," extends into the 1999 BLM PFC Memo attached to the TMDL: "low functioning at risk" streams are in great jeopardy. There is extraordinary reluctance in BLM to admit "nonfunctional" stream condition, since peer-reviewed scientific literature recommends periods of complete rest for streams in non-functioning condition. Complete rest for streams is politically unpalatable. Political pressures color the subjective PFC reviews.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

BLM's own stubble height data for the past four years shows that sufficient vegetation to dissipate energy and protect banks from erosion has not been left on these streams. The claimed "upward trend" of PFC is discounted by the continued stubble height measurement failures, and over-utilization of herbaceous and woody riparian vegetation on these streams in 1996-1999. The subjective nature of PFC makes it readily bent to political pressures. Stubble height measurements are not nearly as subjective. We have attached BLM stubble height data "Stubble Height Provisional Data 1998", Attachment A. BL< has not yet summarized data form 1999, but we have obtained stubble height data for several streams in the SBA, and these stubble heights again have not been met. See Attachment B. Stubble height requirements were attached by BLM to streams in unsatisfactory condition. The 4" stubble height is a very minimal amount, and is insufficient to allow recovery of damaged streams --- yet even this is not met with current grazing practices in the subbasins.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

P.54: DEQ states: "The Functional-at-Risk" PFC rating, the evidence that Redband trout spawn successfully..., the finding that sites appear to be minimally impacted based on the Macroinvertebrate present, indicates that an excessive sediment load may not be occurring at this time." PFC is subjective, it has not done on all streams, and is contradicted by measured stubble height and woody utilization failures on damaged streams, and widespread degradation of streams. Although Redband trout spawn successfully, they may only be able to do so in very limited segments of streams --- likely canyons or rocky areas inaccessible to direct livestock damage. Again, there is absolutely no way to classify Macroinvertebrate data as pointing to "minimal" impairment.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

The proposed Owyhee RMP does not contain adequate management actions to address water quality. Attainment of water quality cannot be dragged out more than 20 years. Livestock enclosures are small, and are routinely trespassed. We visited Johanna Luce and the DEQ crew while they were working on the Big Springs Creek. That same day, trespass cattle were inside the exclosure at the headwaters of Big Springs Creek. BLM has failed to enforce even modest stubble heigh requirements. (See Stubble Height Provisional Data 1996-1998 - Attached).

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Although BLM has not finished compiling 1999 stubble height data, we contacted BLM and obtained data for several streams in the SBA Assessment area. Stubble heights are lower than ever, and permittee has failed to meet criteria once again.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

There is no consideration of cumulative or interacting impacts. For example, high temperatures coupled with excessive nutrients form livestock wastes may exacerbate algae growth in streams and lead to increased turbidity. Both sediments and algae can clog and coat habitats necessary for aquatic species.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ fails to mention spotted frog life history stages, and impacts of impaired waters on this species which is a Candidate for listing under the ESA.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Aesthetic Values and National Significance of Wild Lands and Wild Waters of the North and Middle Fork Owyhee Rivers:

CIHD and ALA are very concerned that DEQ has shirked its duty to address Aesthetic Values of the North and Middle Fork Owyhee Subbasins.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Juniper, Cabin, Corral, Big Spring, Pleasant Valley Creeks and the North Fork Owyhee River are all located within the North Fork Owyhee Wilderness Study Area (WSA). The Idaho Wilderness Study Report (ISR.) pps. 17-29 evaluates the North Fork Owyhee River WSA as follows: "The main and tributary canyons of the North Fork Owyhee River and Current Creek...These canyons are typically narrow, meandering, sheer-walled and have well-vegetated riparian zones." "The area is the most scenic (of 5 WSAs analyzed in Owyhee Wilderness Plan Amendment and EIS)." This WSA met BLM's criteria of Naturalness, Primitive and Unconfined Recreation. Its..."30 miles of deep canyons...attract recreationists interested in backpacking, hunting, fishing, sightseeing, photography and wildlife viewing." Special Features: "The WSA is of exceptional quality because of its specular sheer-walled canyons and rock outcrops highlighted with gnarled juniper. Two sensitive wildlife species, the river otter and the Redband trout..."live here.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Big Willow Spring WSA includes Pole Creek. ISR. p.34. "The WSA's scenic natural features provide outstanding opportunities for primitive and unconfined types of recreation for people interested in backpacking, sightseeing, photography, wildlife viewing, fishing and hunting."

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Squaw Creek Canyon WSA. ISR. p. 45. "Primitive and Unconfined Recreation."

"The WSA's highly scenic natural features provide outstanding opportunities for primitive and unconfined types of recreation for people interested in backpacking, hunting, fishing, sightseeing, photography and wildlife viewing."

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Middle Fork Owyhee River WSA. ISR. p. 56. Primitive and Unconfined Recreation. "The WSA's highly scenic natural features provide outstanding opportunities for primitive and unconfined types of recreation for people interested in backpacking, sightseeing, photography, wildlife viewing, hunting and fishing."

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

In addition, the North Fork Owyhee River becomes a Congressionally designated Wild and Scenic River at the Idaho-Oregon State line. The Middle Fork in Oregon is a tributary to the Main Owyhee WSA. In 1984, Congress designated 120 miles of the Main Owyhee River as a federal Wild and Scenic River pursuant to the WSRA. In the Oregon Omnibus Wild and Scenic Rivers Act of 1988, Congress added 57 miles of the West Little Owyhee and nine miles of the North Fork Owyhee to the national wild and scenic river system. Congress classified all three segments as wild. The "wild" classification is the most restrictive of three possible classifications, and provides the highest degree of protection.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ p. 53 states: "IDEQ evaluation of Oregon water quality standards showed that the Middle and North Fork Owyhee Rivers are impairing salmonid rearing uses at the Idaho/Oregon state line." This is alarming, given that downstream Wild and Scenic River corridors are Congressionally mandated to be managed to provide the highest degree of protection. DEQ has admitted that Idaho waters are impairing values of the WSR.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

The Proposed Owyhee Resource Management Plan Appendix RECT-2, Vol. 2, provides "Final Eligibility and Classification Determinations for Potential Wild, Scenic and Recreational River Designations." BLM's assessment found Recreation to be an Outstandingly Remarkable Value of the North Fork Owyhee River (16 miles), and segments of Juniper Creek, Cabin Creek, Corral Creek, Noon Creek, and Pleasant Valley Creek.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

In all streams in these subbasins, we have observed severe grazing impacts each year: Herbaceous riparian vegetation is stripped to ground level, streambank areas accessible to livestock are universally trampled and have damaged, often collapsing banks. Livestock feces and urine pollute banks. Cow pies clog the water. The stench of livestock waste permeates the air in and around streams. Wading in this water stirs up clouds of brown, murky sediment. Alga clogs the surface of slow-moving water, and coats instream rocks and other substrates with a slimy covering. Frankly, we are often afraid to let our dogs drink or come in contact with the livestock-fouled waters of the Middle and North Fork Owyhee systems.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

These environmental conditions and their impacts must be addressed by DEQ in development of TMDLs for sediment, bacteria and aesthetics in the North and Middle Fork Owyhee Sub-basins.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

DEQ must withdraw the Draft TMDL, and prepare a new Draft SBA/TMDL that addresses sediment, bacteria, and aesthetics. The temperature TMDL included in the present document must be augmented, and includes parameters necessary to support all life stages of salmonids, and other cold water aquatic organisms.

Response: Comments are not directed at the South Fork Owyhee River SBA-TMDL.

Leigh Woodruff, Idaho TMDL Coordinator
Environmental Protection Agency/Idaho Operations Office

Although this report is an assessment and not a total maximum daily load (TMDL), we believe that a TMDL is required for temperature, given the significant accedences of temperature criteria documented in the assessment. Since temperatures exceed Idaho standards as the river enters Idaho from Nevada, we believe the TMDL should establish a temperature allocation for sources in Nevada such that Idaho criteria are met at the border. Idaho has a right that waters entering the state meet its water quality standards [see Arkansas v. Oklahoma, 503 U.S. 91 (1992)], and establishing a load allocation as a target for Nevada is consistent with case law. Clearly Idaho could not implement the allocation for Nevada since it lacks authority, and we would recommend clarifying this point in the TMDL.

Response: A TMDL for temperature has been incorporated into the document.

We also have a few specific comments as follows:

P.26 The "Periphyton Data" (Appendix D) discussion presents conflicting conclusions. Dr. Loren Bahls found "full support of cold water biota," but the "Diatom-Idaho Biotic Index" results indicated "Not Full Support" of cold water aquatic life. An explanation of this discrepancy would be useful.

Response: The use of the Large River's assessment is still in draft form. The use of pariphyton information collected and identified by Dr. Bahls showed that some of the species found in the South Fork Owyhee River were not included in the indices used to calculate Idaho's D-IBI. As more information is collected on Idaho rivers, especially in the High Desert Ecoregion, the assemblages used in the D-IBI will become more refined.

P.31 Under "Sources," the statement is made that there is "one known input from agriculture...the 45 Ranch." The study concludes that "thermal modification would be very limited" by this source. Temperature data were obtained at this site but only "upstream of any agricultural return sites at 45 Ranch." We believe that the discussion regarding the effect that this return could have on the S.F. Owyhee River temperature should be expanded, and recommend that the temperature above and below the irrigation return flow be measured in the future to verify its effect.

Response: If resources are available, further temperature analysis will occur at the 45 Ranch. However, it should be noted that withdrawals during the 1999 monitoring season did not indicate any adverse impacts (the river never dried up). Diversions from the South Fork Owyhee River were never greater than 2-3 cfs during periods when DEQ was at the site.

A characterization of the width/depth ratios in the S.F. Owyhee River and its effect on temperature would also be available. Since temperatures at the border exceed standards, could high width/depth ratios in Nevada and Idaho be contributing to elevated temperatures? Could anthropogenic changes in hydrology or bedload sediment transport in Nevada and Idaho be a factor in contributing to high width/depth ratios and elevated temperatures?

Response: It was not the scope of this document to evaluate land use in Nevada. From River Mile 52 to the 45 Ranch diversion, no other diversion structures were noted. High width/depth ratios are discussed in Section 2.7.1. It is believed most river morphology is dictated by the river canyon itself. However, permanent riparian evaluation sites have been established to assist in determining if changes in landuse do occur, benchmark data is available to determine changes.

Scott Brown
Idaho Conservation League

Please accept these comments on the draft South Fork Owyhee SBA/TMDL on behalf of the 3,000 members of the Idaho Conservation League.

It is unclear if all applicable water bodies were assessed for all parameters (for example, the Little Owyhee, an intermittent stream which drains a large watershed). All water bodies, including ephemeral and intermittent need to be assessed in the SBA/TMDL process. These water bodies need to have their beneficial uses protected and can also be significant loaders of sediment, nutrients, bacteria, etc.

Response: The Little Owyhee River is not on the 1996 303(d) List as an impaired waterbody and was not assessed. Water quality information collected in 1999 did not indicate loading from the tributaries for sediments, nutrients or bacteria.

Temperature

Given the interstate nature of the South Fork we believe it's appropriate that Idaho work with Nevada to ensure the South Fork gets 303(d) listed and that Nevada commits to addressing temperature and other issues ASAP.

Response: It is not within the scope of this document to assess the landuse practices within the State of Nevada. Since the South Fork Owyhee River is Interstate waters, it will the responsibility of the United States Environmental Protection Agency (EPA) to initiate dialogue with the State of Nevada. If the State of Idaho can offer assistance, this option will be explored.

Idaho's contribution to temperature accedences needs more thorough assessment.

Response: Temperature capacity and allocations have been incorporated into Section 3.0.

Sedimentation and diversion are almost certainly contributing factors on the Idaho side .

Response: During the 1999 monitoring effort and the data obtained during that effort, it was determined that sediments were not impairing the beneficial uses or were State of Idaho water quality standards exceeded. Flow modification is not recognized as a pollutant of concern that can adequately addressed in the TMDL process.

IDEQ should also acknowledge that temperature criteria protecting a single salmon life stage (spawning) is inadequate. State criteria and TMDLs must protect all life stages of the salmon if beneficial uses are to be recovered and protected.

Response: Comment noted.

Sediment

The North and Middle Fork Owyhee Rivers SBA/TMDL noted that "the most likely impacts of the current sediment load within these drainages to the beneficial used is an overall trend in pool filling resulting in a loss of deep, cool water refuge space." We suspect the same is probably true for the South Fork as well. This needs to be reasonably assessed in this SBA/TMDL.

Response: Limited time and resources were available to assess the entire river reach. It is recognized that there is data lacking for pool filling and other impacts from bed-load sediments (Sec. 2.6.2)

The DEQ has an uncanny ability to ignore its own data when those point toward impairment. The periphyton report (Appendix C) found "minor" to "moderate" impairments of aquatic life uses, and determines that the El Paso Pipeline site was only **partially supporting aquatic life** uses in July 1999. P.1 Well also question the basis for judgement calls that aquatic life uses can suffer from "minor" impairments and be fully supporting at the same time.

Response: The El Paso Pipeline site is in the State of Nevada. It was not within the scope of this document to determine support status of beneficial uses in adjoining states.

This study also found the South Fork to be in poorer condition than the East Fork reference stream and concluded that temperatures, siltation, and inorganic nutrients (phosphorus) are the likely causes of impairment.

Response: Samples collected from the East Fork Owyhee River were not intended to used as a reference site. Samples were collected to assist in comparing the South Fork water quality and biological information with a similar drainage/watershed. Dr. Bahls' report did not indicate that aquatic life was not supported at the Idaho site.

The Macro invertebrate data from the 45 Ranch showed impairments as well ("a reduced population"). Despite this evidence of impairment, the DEQ has determined sediment can be ignored because habitat and sediment can be ignored because habitat and sediment are not the liming factors. It seems reasonable to assume that there is not a single liming factor. Temperature, habitat, water chemistry, flow and other variable are inextricably linked together and determine ecosystem health.

Response: Macroinvertebrate data did not indicate that cold water biota was impaired at the Idaho site and that expected abundance and species present were what to be expected. Limited substrate information from 1999 and Allen (1995) did not indicate that substrate habitat was limiting cold water biota.

We continue to question the subjective nature of the DEQ's macro vertebrate assessments: the lack of reference conditions, the number of and selection criteria for monitoring stations, and overall monitoring frequency.

Response: Marcoinvertebrate assessment was made on the Idaho River Index (Royer and Minshall, 1996, 1997 and 1999). This index offers an examination using reference rivers throughout the state. It is recognized that the High Desert Ecosystem offers a unique ecology condition and further assessment for reference conditions should be explored.

Sedimentation is also important to address in the South Fork due to potentially direct influences on temperature.

Response: Sediments were assessed to determine impairment to beneficial uses and if Idaho water quality standards were exceeded. It was not within the scope of the Sub-basin Assessment to determine what the affects sediments have on temperature in the South Fork Owyhee River.

The relative lack of turbidity data, failure to adequately assess pool frequency and quality and the subjective nature of other data makes ignoring sediment in this TMDL a difficult action to defend.

Response: It is recognized that a full assessment of pool depth, frequency and quality is lacking and is recognized in Sec 2.6.

Nutrients

The report by Dr. Bahls (Appendix C) states that the El Paso Pipeline site was only **partially supporting aquatic life** uses in July 1999 and that the probable cause was phosphorus enrichment. P 1 This report also states that the aquatic life impairment noted at the 45 Ranch was probably caused by "nutrient enrichment" and that there were "several signs of inorganic nutrient, probably phosphorus, enrichment at both South Fork sites in July" p 11.

Response: The El Paso Pipeline site is in the State of Nevada. It was not within the scope of this document to determine support status of beneficial uses in adjoining states. Water quality data did not indicate a nuisance aquatic growth presence that would impair beneficial uses.

Flow

Impacts from diversions (45 Ranch etc..) do not appear to have been assessed. Flow conditions relate directly to temperature and other parameters.

Response: The 45 Ranch diversion is the only diversion structure on the South Fork Owyhee River within the State of Idaho. Diversions and impoundments were not assessed outside Idaho. Flow modification is not recognized as viable pollutant of concern to be addressed in a TMDL.

Conclusion

Despite the apparent absence of the salmon species, IDEQ is proposing no action to recover beneficial uses in this SBA/TMDL. That is obviously unacceptable.

Response: DEQ has modified the Sub-basin Assessment and has established temperature load capacity and allocations as waters enters the state, and reduction goals that would be required to achieve Idaho water quality standards within the State.

Idaho Department of Fish and Game

The primary limiting factors indentified in the draft documents for the beneficial uses of coldwater biota and salmonid spawning are the result of degraded stream-riparian ecosystems. High water temperatures documented in the subbasins are partly the result of a general lack of stream shade due to degraded overstory riparian vegetation communities. Other than pool quality and substrate sediment, the draft documents generally lack discussion of other critical instream habitat parameters that are largely influenced by riparian conditions (e.g., streambank conditions, large woody debris, width:depth ratios, pool frequency, water depth). These habitat descriptors significantly influence the health of aquatic biota. We realize these assessments were limited in scope, but other than pool volume, what other habitat parameters will be measured by the Division of Environmental Quality (DEQ) in the future? Is the Bureau of Land Management (BLM) monitoring these descriptors on their lands?

Response: Other parameters such as streambank condition and riparian area are addressed in Sec 2.7.1. of the Sub-Basin Assessment. Width depth/ratios were obtained at both Idaho and Nevada. Riparian vegetation was assessed at both sites maily to determine trend analysis and river morpholoy characteristics. The BLM is current conducting an ariel survey for Properly Functioning Condition, to date, this information is not available.

Throughout the Owyhee Resource Area of the BLM, the BLM's primary management concern is the degradation of riparian communites. They cite livestock grazing as the primary factor degradingriparian systems. This concurs with our of the key findigns for the Owyhee Uplands listed in the ecosystem assessment of the Interior Columbia Baaasin (Quigley and Arbelbide 1997).

Response: Comments noted.

Redband trout are a BLM Sensitive Species and a State of Idaho Species of Special Concern. In

April 1995, a petition was filed to list the interior redband trout of Idaho, Oregon, and Washington under the Endangered Species Act. In September 1995, the U.S. fish and Wildlife Service concluded the existing data did not support proposing the species for listing. In our opinion, if state and federal agencies do not promote and implement significant landscape scale improvements to riparian and aquatic environments in the Owyhee River Basin, then potential fish and wildlife species listings under the Endangered Species Act remain a possibility.

Response: Comments noted.

In addition to aquatic species, the IDFG has previously expressed a number of concerns regarding wildlife species inhabiting the Owyhee River Basin, particularly on federal lands. A great number of these wildlife-related issues involve the existing degraded condition of stream-riparian ecosystems on BLM lands. Wildlife habitats are a beneficial use. Rehabilitating riparian and wetland areas on federal lands will significantly benefit a number of wildlife species. To put our concerns in perspective, we are enclosing comments submitted to the BLM regarding the Draft Environmental Impact Statement (EIS), and those submitted for the State of Idaho's consistency review for the Proposed Owyhee RMP and Final EIS.

Response: Comments noted.

We concur with the DEQ's findings that increased stream shading is necessary to achieve Idaho's stream temperature standards. This requires significant basin-wide improvements in riparian-wetland vegetation communities. This will involve necessary changes to livestock grazing practices and strategies across land ownership. We think the DEQ can play an invaluable role in riparian-wetland restoration by ensuring compliance with water quality standards.

Response: Comments noted.

Draft Owyhee Resource Management Plan and Draft Environmental Impact Statement

The Idaho Department of Fish and Game (IDFG) has completed its review of the Draft Owyhee Resource Management Plan (RMP) and Draft Environmental Impact Statement (DEIS) and offers the following comments for your consideration. These comments are offered as per our authority under Idaho Code Section 36-103 and Fish and Game Commission direction found in **"A Vision for the Future, Idaho Department of Fish and Game, Policy Plan 1990-2005."** The Bureau of Land Management (BLM) has provided the IDFG with numerous opportunities to identify specific concerns throughout the years of preparation of these documents. These efforts are greatly appreciated.

Wildlife Habitat

The IDFG has species management plans adopted by the Fish and Game Commission. As such, they function as supplements to the Commission approved 15 year Policy Plan. These management plans provide the IDFG with policy direction to manage Idaho's wildlife resources as per our legal mandate. Input was provided during the review process in development of these plans from IDFG personnel, other agencies and entities, and the genral public. These management plans were prepared with a five year life span

Riparian habitats were frequented by mule deer where a well developed shrub component was present. Use of riparian areas was particularly important in drought conditions (Milner 1995). Junipers provide hiding/escape cover during the hunting season and thermal protection in winter.

Response: Comments noted.

According to the BLM, about 87% of riparian areas surveyed to date in the ORA are in nonfunctional/functional-at risk (unsatisfactory as defined by BLM) condition. Generally, the BLM found that these degraded riparian areas contained low plant diversity dominated by Kentucky bluegrass with little shrub canopy coverage. These conditions are not suitable or adequate to provide for the needs of mule deer.

Response: Comments noted.

Invasion of western juniper into shrub steppe communities has reduced the amount and productivity of shrub steppe habitats over significant portions of the ORA. This loss of sagebrush communities is generally believed to reduce availability and quality of mule deer habitat and there fore have a negative impact on mule deer populations. Mountain mahogany stands that historically provided important mule deer habitat in protions of the ORA have been lost to juniper invasion and insect infestations. Reproduction in these stands appears to be nearly absent.

Management Opportunites

<u>Implementaiton of the following recommendations are necessary to meet IDFG management goals for mule deer:</u>

Maintain or restore riparian habitats to achieve Proper functioning conditon (PFC) on all streams by the end of the planning period. We refer to the concept of PFC as defined by the BLM in Barrett et al. (1993). A marked improvement in the riparian shrub component would provide the most benefit to mule deer.

Response: Comments noted.

Late summer, fall and winter livestock grazing of deer winter ranges should occur only if it can be managed to enhance winter mule deer forage abundance. Livestock grazing of winter ranges should be designed to benefit mule deer by improving the shrub component.

Sagebrush eradication and introduced grass seeding projects should avoid winter range areas. See also recommendations for seedings.

Implementation of the following recommendations will **contribute** to the attainment of IDFG management goals for mule deer:

General improvements in upland range condtions that encourage a stable native forb, grass and shrub component in shrub steppe habitats will benefit mule deer and reduce competition with livestock.

Juniper should be controlled in areas where it is invading shrub steppe communities to reduce the loss of mule deer habitat. Eradication of Junipers in areas where shrub steepe and mahogany habitat has been lost will improve the productivity of the land for mule deer if the area is properly rehabilitated. See also recommendations for juniper control.

Maintain Douglas fir, aspen, and mountain mahogany communities.

Response: Comments noted.

Pronghorn Antelope

IDFG Management Goal: Maintain current population size in those big game management units located in the Owyhee Resource Area.

Current Situation/Management Challenges

Pronghorn antelope populaitons in the ORA have been relatively stable for the last decade. Antelope spend the spring, summer and fall in the ORA. Antelope migrate out of the ORA depending on the severity of the winter. Some winter range is present in the ORA.

Habitat factors known to limit antelope populations include loss of shrub steppe plant communities to wildfire and sagebrush eradication, disruption or blocking of migration routes, and competition with livestock.

Unlike many other ungulates, antelope do not build up large reserves of body fat to get them through the winter. They are therefore not able to survive for long periods without forage. Their main strategy for survival during periods of food shortage is to migrate t areas where food is available, hence the importance of magration corridors and large expanses of shrub steppe habitat.

Conversion of sagebrush steppe plant communities to seeded monocultures of exotic grasses such as crested wheatgrass has a negative impact on antelope habitat and populations, particularly if they include fawning areas or winter range. Shrubs are an essential component of antelope habitat because they comprise a major portion of the diet and provide cover for fawns. Shrubs are particularly critical in winter ranges because they provide a food source above the snow. Shrubs can provide over 70 % of the usual winter diet and probably near 100% during severe winters (Kitchen and O'Gara 1982).

Livestock grazing in antelope winter range areas in the late summer or fall reduces the amount of forage available to antelope during winter. Intensive grazing in fawning areas can also reduce the forage available for antelope during this critical time of the year. Forbs are particularly important to antelope during the fawning period.

Improperly constructed fences can create significant migration barriers to antelope. Fences must be constructed to allow antelope to crawl under them.

Response: Comments noted.

Management Opportunites

Implementation fo the following recommendations are **necessary** to meet the IDFG management goals for pronghorn antelope:

Fences in antelope habitat must be designed to allow passage. Current BLM antelope passage fence design is adequate.

Sagebrush habitats in fawning areas and winter ranges should be maintained or improved. These areas should be avoided when planning seedings.

Implementation of the following recommendations will **contribute** to attainment of IDFG mange goals for pronghorn antelope:

General improvements in upland range condition that encourage a stable forb, grass, and shrub component in shrub steppe habitats will benefit antelope and reduce competition with livestock.

Late summer, fall, and winter cattle grazing of antelope winter ranges should be minimized to enhance winter forage abundance for antelope.

Response: Comments noted.

California Bighorn Sheep

IDFG Management Goas: a) Increase bighorn sheep herds in the Owyhee River drainage by 10%-20%; b) establish new population; c) increase harvest and d) provide more recreation.

Current Situation/Management Challenges

Four releases of California bighorn sheep from British Columbia into Owyhee county in the 1960's provided the nucleus of the herds along the Owyhee river and the Jacks Creek drainage. These herds grew steadily and by 1980 were will established. The Owyhee County bighorn populations have been used as a source for transplants for other areas of the state and nation.

Currently the size of the bighorn population in the ORA is lower than it has been in the recent past and is below carrying capacity. This drop in population size is due primarily to two factors: removal of sheep for transplant to other areas and a combination of drought and winter weather resulting in direct mortality and reduced production. Data collected in 1996 and 1997 indicates these populations are increasing.

Habitat factors known to limit bighorn sheep are the presence of domestic sheep in areas occupied by bighorns, competition with livestock, particularly on bighorn winter ranges and disturbance of lambing areas.

Bighorn sheep utilize the grass covered benches along the canyon rims of the Owyhee River. Isolation of these forage areas by rimrock reduces competition between livestock and bighorns. The potential of competition between livestock and bighorns may intensify adjacent to the canyons as numbers of either increase. Bighorn sheep and cattle have the highest potential for competition where cattle make substantial use of bighorn sheep winter range during the fall and winter.

The largest impediment to restoring bighorn sheep and to maintaining bighorn sheep populations is the potential for disease transmission from domestic sheep that graze near or within historical and occupied bighorn sheep ranges. Bighorn sheep and domestic sheep are not compatible when occupying the same ranges even when they are not using the area at the same time.

Managment Opportunites

Implementation of the following recommendations are **necessary** to meet IDFG management goals for California bighorn sheep:

Grazing allotments in the ORA in occupied or potential bighorn sheep habitat must be maintained as cattle allotments and not converted to domestic sheep grazing.

Implementation of the following recommendations will **contribute** to the attainment of the IDFG management goals:

Fall and winter grazing of bighorn winter ranges should occur only if it can be managed to enhance winter forage abundance for bighorns.

General improvements in upland range condition that include a stable forb, grass, and shrub component in shrub steppe habitats adjacent to canyon areas occupied by bighorns will benefit bighorns and reduce competition with livestock.

Response: Comments noted.

Rocky Mountain Elk

IDFG Management Goals: Maintain the size of elk herds in big game management units located in the ORA

Current Situation/Management Challenges

Huntable populations of elk were present in the ORA in the 1960's. The population was intentionally eliminated with liberal hunting seasons. In the 1990's elk populations became established again in the ORA as elk populations increased in that portion of Oregon immediately to the west. By 1994 populations reached huntable levels.

Management Opportunities

Implementation of the following recommendations are **necessary** to meet the IDFG management goals for elk:

Enhance public access to public lands in those portions of the ORA frequented by elk.

Implementation of the following recommendations will **contribute** the attainment of IDFG management goals:

General improvement in upland range condition that encourages a stable native grass, forb, and shrub component in shrub steppe habitats will benefit elk.

Response: Comments noted.

Sage Grouse

IDFG Management Goals: Double (approximately) sage grouse population levels in the next ten years. Establish Local Working Group (LWG) to identify problems and devise site specific solutions.

Current Situation/Mangement Challenges

Currently sage grouse populations in the ORA are low. Over the short term, depressed populations are most likely due to the effects of pronlonged drought. However there have been some significant habitat losses in portions of the ORA that have contributed to a long term decline in sage grouse. In spite of this the ORA still has large relatively intact sagebrush-grass communities which provide large expanses of sage grouse habitat.

Habitat factors limiting sage grouse are competition with livestock and loss of shrub steppe habitats due to juniper invasion, wildfire, and sagebrush eradication projects.

In the 1960's and 1970's, Idaho had large numbers of sage grouse and extensive livestock grazing. Livestock grazing and sage grouse habitat are compatible to a degree. However, in the drought conditons experienced from 1987 to 1994 it is believed that livestock grazing had a more serious impact on sage grouse habitats than in years of normal precipitation. Grazing can occur in sage grouse habitats provided that adequate nesting, brooding, and winter habitat are provided for in the ORA.

In 1996, in response to declining sage grouse populations statewide, sage grouse hunting opportunities were significantly reduced by the Fish and Game Commission. In mid-1997, the Commission adopted the Idaho Sage Grouse Management Plan. In this plan are statewide strategies as well as a number of habitat-related strategies specific to the Owyhee County area. The plan calls for establishment of Local Working Groups (LWG) to determine sage grouse habitat problems and devise solutions. These LWG's will be compsed of land managers and land owners, permittees, the IDFG, and sportsment.

Managment Opportunities

<u>Implementation of the following recommendations are necessary to meet the IDFG management goals for sage grouse:</u>

Maintain adequate nesting habitat (15-25% sagebrush canopy with an adequate residual herbaceous cover for nest concealment) in traditional nesting areas (within two miles of leks).

Maintain adequate early and late brood rearing habitat. Early brood rearing habitat has 15-25% sagebrush canoipy and a healthy

Response: Comments noted.

Bill Gram
Idaho Department of Water Resources

I received copies of the *North and Middle Fork Owyhee Draft Subbasin Assessment and Total Maximum Daily Load* and *South Fork Owyhee River Draft Subbasin Assessment.* I requested David Blew, our planning team aquatic biologist, to review and provide comments he felt appropriate. **His review of the South Fork Owyhee assessment found no real problems**. He felt the assessment was a true reflection of the situation on the South Fork and agrees that a TMDL is not an appropriate method for addressing problems in that basin.

Response: Thank you for your comments.

Public Comments Received

North and Middle Fork Owyhee Draft SBA and TMDL

Commentator: Idaho Watersheds Project

1. The data and information used was insufficient for assessment of pollutant impacts and attainment of Idaho water quality standards.

- The biological and chemical data collected in 1999 is insufficient to dismiss sediment and bacteria as impairments to the beneficial uses.
- The current BURP protocol assessments are insufficient to determine compliance with sediment, cold water biota, and salmonid spawning standards.

Response:

In May 1995 the Ninth District Court ruled on a case brought against the EPA by the Idaho Sportsmen's Coalition, et al., charging the EPA to take steps toward eliminating pollution in Idaho's water bodies of pollution (Ninth District Court, Case Number C93-943WD, 1996). The findings by the Ninth District Court sided with the plaintiffs and specified the need to establish an expedient schedule for TMDL completion.

The initial 25 year schedule proposed by the EPA was found to be legally deficient because of its slow pace. The final ruling specifically stated that, "a lack of precise information must not be a pretext for delay." The ruling also specifically stated that, "water quality limited segments (WQLSs) are, by definition, water bodies that are not expected to attain applicable water quality standards through application of existing pollution controls." That, "The CWA requires that a TMDL must be proposed for every WQLS." Also, "WQLS lists are dynamic and . . . states may delist water bodies that attain standards.".

The Idaho Administrative Procedures Act (IDAPA 16.01.02.053) specifies that, when determining whether a water body fully supports designated and existing beneficial uses, the IDEQ is to determine whether all of the applicable water quality standards are being achieved and whether a healthy, balanced biological community is present. It also specifies that the IDEQ is to utilize the Water Body Assessment Guidance (IDEQ, 1996) to assist in the assessment of beneficial use status. Revisions to the 1996 Guidance are underway but have not been completed and incorporated into the State rules at this time.

Idaho's process for meeting its TMDL development schedule call for a Subbasin Assessment (SBA) to be completed for the North and Middle Fork Owyhee hydrologic unit by December 1999. One of the objectives of the SBA is to review the beneficial use support status on water bodies placed on the 303(d) list. This review is necessary because many of the stream segments listed on the 1996 303(d) list by the EPA were listed without the benefit of water quality data (evaluated), rather than listed based upon water quality data (monitored). For each of the listed water bodies the SBA evaluates whether:

(1) A TMDL for a listed pollutant is required;
(2) The water body should be removed from the 303(d) list; or
(3) Additional streams or pollutants should be placed on the 303(d) list and included in Idaho's TMDL completion schedule.

The SBA is an opportunity to consider water body specific data, more recent data, and any changes in water quality subsequent to the original listing of a water body. The short time frame provided little opportunity to conduct additional monitoring activities for the listed water bodies or those water bodies lacking established BURP monitoring sites. This SBA examines all of the available data as of September 1999, including some collected by IDEQ specifically for this effort.

2. The final TMDL must include a commitment for an annual assessment of compliance with other areas of water quality which are not addressed under the draft TMDL, with a schedule for addressing needed changes in the TMDL.

Response:

Current IDEQ resources support Beneficial Use Reconnaissance Protocol (BURP) by monitoring water bodies once every five years. Please check with the appropriate BLM office for future and ongoing monitoring efforts in the North and Middle Fork Owyhee hydrologic unit.

Upon approval of this TMDL by EPA Region 10, a North and Middle Fork Owyhee TMDL Implementation Plan will be developed by designated supporting agencies and stakeholders. The Idaho Water Quality Standards directs appointed basin and watershed advisory groups (BAGs and WAGs) to provide public review on recommended actions to achieve the water quality targets listed in the North and Middle Fork Owyhee TMDL. This implementation plan is to be completed within eighteen months of final TMDL approval by EPA Region 10.

Implementation plans are essential steps in the process of restoring beneficial uses and assuring compliance with water quality criteria. An implementation plan is guided by an approved TMDL and provides details of actions needed to achieve load allocations, a schedule of those actions, and follow up monitoring to document progress or provide other desired data. Implementation plans specify the local actions that lead to the goal of full support of beneficial uses. The North and Middle Fork Owyhee TMDL Implementation Plan will aim to be the most appropriate plan for nonpoint solar energy pollution controls. The Plan will list activities which are to be implemented by land managers within the community to enhance the water quality of the North and Middle Fork Owyhee hydrologic unit. The Plan will include specific actions to meet the TMDL targets and a schedule for implementation of each activity. Important elements of this plan will be:

- A description of pollutant control actions.
- A schedule of actions with interim milestones.
- A discussion of reasonable assurance.
- A description of legal authorities for control actions.
- An estimate of when water quality standards will be attained.
- A monitoring and/or modeling plan to determine effectiveness of controls.
- Measurable interim milestones for water quality.
- A description of the process for revising the TMDL if milestones are not being met.

The development and writing of this plan are the charge of the local offices of designated agencies in Idaho's water quality law, with assistance from the IDEQ. Implementation plans are to be reviewed by the WAG and BAG for their approval, and submitted to IDEQ for certification that they will meet state water quality standards.

The Idaho Watershed Project is encouraged to participate in the formation of the WAG, and the development of the North and Middle Fork Owyhee TMDL Implementation Plan. By continuing to collaborate and cooperate with local landowners and designated land management agencies we can expedite the achievement of high water quality in this region.

3. Full support of the beneficial use "aesthetics" is not addressed.

Response:

The aesthetics use has no specific criteria associated with it and thus the general surface water quality criteria (IDAPA 16.01.02.200) are to protect aesthetics. These general criteria apply to all uses and it is assumed that aquatic life and recreation uses are more demanding than aesthetics, so that if they are met for the former they are met for the latter. The 1996 WBAG specifies that all Wildlife Habitat and Aesthetics Status beneficial uses equal "Full Support" (IDEQ, 1996; page 33).

4. Habitat degradation and flow alteration must be addressed in the TMDL implementation plan.

Response:

Flow and habitat alterations are not considered "pollutants" under the Clean Water Act requiring "loading limits" to be established under a TMDL. The North and Middle Fork Owyhee SBA and Temperature TMDL evaluated whether pollutant load reductions are required for the listed pollutants (i.e., temperature, sediment and for the North Fork Owyhee River, bacteria). In order to attain beneficial use support within some water bodies, flow and habitat alterations may need to be considered. The IDEQ suggests that the best place to address these needs is in the TMDL Implementation Plan.

5. State temperature criteria and TMDLs must protect all life stages of salmonids.

Response:

State of Idaho TMDL documents are water quality management plans established to attain current water quality standards and manage pollutants that are found to impair beneficial uses. Current state temperature criteria for salmonid spawning and cold water biota was originally set to protect all life stages of salmonids. These criteria were developed per EPA guidance at the time and met with EPA approval. With the benefit of twenty years of additional knowledge and experience, these criteria are now being questioned regionally and considered for refinement. The outcome of that reexamination, and the establishment of new criteria, is likely several years away.

Revisions to current water quality standards are generally done through a public process known as "Negotiated Rule Making Process." This process is conducted once every three years. The Idaho Conservation League is encouraged to provide input and suggestions to the Negotiated Rule Making Committee regarding its concerns over salmonid temperature requirements.

6. A lack of data to evaluate whether excess sedimentation is occurring does not mean that a sediment TMDL is not required.

Idaho's numeric sediment standard for cold water biota place limits for water column turbidity to 25 NTU for over a ten-day period or 50 NTU at any time. All of the available turbidity data for water bodies within the North and Middle Fork Owyhee hydrologic unit are less than 25 NTU.

Idaho's narrative water quality standard for sediment relies on an assessment of beneficial use impairment due to an excessive amount of sediment. This assessment is predominately based on an examination of existing beneficial uses such as salmonid spawning and rearing, or abundance and assembledges of macroinvertebrates.

In the case of the water bodies located within the North and Middle Fork Owyhee hydrologic unit, salmonid spawning and rearing occur in each water body examined. Also, all of the recent and historical macroinvertebrate data for each of the listed stream segments meet or exceed the State of Idaho's 1996 Water Body Assessment Guidance for macroinvertebrates (i.e., a score greater than 3.5).

A qualitative look at macroinvertebrate samples collected during the summer of 1999 shows that, while most of the species presents tolerate disturbances, most of the samples have species that are generally associated with good water quality conditions (Appendix C). An exception to this generalized statement is that cold water biota indicator species are absent within five of the seven water bodies sampled (i.e., the samples collected for North Fork Owyhee, Cabin, Corral, Pleasant Valley, and Squaw Creeks). However, historical macroinvertebrate data from the North Fork Owyhee and Corral Creek do contain cold water biota indicator species. Therefore, the only streams where cold water biota indicator species have not been found are, Cabin Creek, Pleasant Valley Creek, and Squaw Creek.

The lack of cold water biota indicator species within the 1999 samples collected from the water bodies located within the North and Middle Fork Owyhee hydrologic unit, however, may be due to a deviation from normal IDEQ protocol used in the collection of these samples. For example, rather than collecting three samples and composite these into one jar for analysis, only one sample was collected from each water body. Due to this and other sampling considerations, while the presence of cold water biota indicator species provides a definite "positive" result in both the 1999 and the historical data, the absence of cold water biota indicator species in a given sample does not provide a definite "negative" result.

Additionally, it is important to keep in mind that the cold water biota indicator species list is a draft list only. The formation of this list has been a dynamic process as additional information was obtained. And, it is possible that the current list does not contain all of the possible cold water biota indicator species found in this ecoregion.

An examination of the available surface substrate data shows that portions of seven of the nine water bodies contain riffles with around 30% fines. The two water-bodies that do not show these low values for percent fines are Corral Creek and Big Spring Creek. However, both of these streams support redband trout populations and contain cold water biota indicator species of macroinvertebrates. Please note that the current state water quality standards for sediment do not specify minimum requirements for surface substrate conditions. Also, neither of these streams has been identified as water quality limited due to sediment impacts (i.e., they are not listed on Idaho's 1998 303(d) list for sediment).

In summary, a review of the biological or chemical sediment data available for the North and Middle Fork Owyhee hydrologic unit shows no violations of applicable water quality standards for sediment and shows no impairments to the current biological community according to the 1996 Water Body Assessment Guidance (IDEQ, 1996). Therefore, the IDEQ does not recommend any sediment load reductions at this time. However, under the Idaho water quality standards for antidegradation (IDAPA 16.01.02.051), the water quality within these drainages must remain adequate to protect the existing uses fully. Therefore there can be no increases to the current sediment load within these drainages in amounts that would impair the existing uses.

7. The Proper Functioning Condition assessment of "functional - at risk" should require action to facilitate a higher function rating.

Response:

While PFC analysis is highly subjective, the determination of "functional - at risk" does cause the BLM to revise the grazing management system within the vicinity in order to eventually achieve a rating of "proper functioning condition" for 85% of the stream miles under the preferred alternative (Alternative E) in the Proposed Owyhee Resources Management Plan (1999).

8. Why were load reductions for bacteria not established after initial indication that state bacteria criteria were exceeded during the month of August 1999?

Response:

An error by the State Laboratory Services rendered the last sample of the five-sample August monthly geometric mean analysis unusable. Therefore, additional samples were collected in September in order to conduct this assessment. While the August samples did show a trend toward criteria exceedance for fecal coliform according to the five-sample geometric mean, the samples collected in September did not show the same trend. If they had, then a load reduction for fecal coliform would have been proposed. Neither the Oregon standards for E. coli nor the proposed E. coli standards for the State of Idaho showed any trend toward standard exceedances.

However, even though no bacteria load reductions are proposed at this time, under the Idaho water quality standards for antidegradation (IDAPA 16.01.02.051), the water quality within these drainages must remain adequate to protect the existing uses fully. Therefore, there can be no increases to the current bacteria load within these drainages in amounts that would impair the existing uses.

9. Withdraw the current Draft TMDL and resubmit a new document that addresses all areas of exceedances and a more thorough assessment of conditions.

Response:

Your comment has been noted. Please see the response to your first comment regarding the court ordered time frame for document completion.

10. The development of an implementation plan should be accelerated and made part of the final TMDL.

Response:

Pursuant to the federal district court order in 1996 (see response to comment #1), the U.S. Environmental Protection Agency (EPA) issued a §303(d) list for Idaho, which identified 962 water bodies requiring TMDLs. The EPA and the IDEQ also submitted a schedule to the court for developing all required TMDLs on the 1996 §303(d) list within eight years. In the schedule, WQL water bodies are grouped by sub-basin, such that all TMDLs within the sub-basin will be developed at the same time.

In 1998, five water-bodies within the North and Middle Fork Owyhee River basins were classified as water quality limited due to excessive sediment, high temperatures, and flow modification under §303(d) of the Clean Water Act[1]. These water bodies include, Middle Fork Owyhee River, Squaw Creek, Noon Creek, Juniper Creek, and Pleasant Valley Creek. The North Fork Owyhee River was classified as water quality limited due to excessive bacteria. It is expected that the EPA will add two water bodies to this 303(d) list, Cabin and Corral Creeks, along with the North Fork Owyhee, for temperature criteria violations based on available stream temperature data (Woodruff, 1999).

The TMDL development process is currently divided into three parts; 1) development of a sub-basin assessment; 2) development of water quality targets, loading estimates, assimilative capacity, and allocations; and 3) development of an implementation plan. Steps 1 and 2 are considered to be the TMDL required for EPA submittal and approval under the eight-year development schedule. Step 3, the implementation plan, is to be developed within 18 months of EPA approval of Steps 1 and 2.

11. Idaho's Best Management Practices for agricultural nonpoint source should not be entirely voluntary.

State of Idaho TMDL documents are water quality management plans established to attain current water quality standards and manage pollutants that are found to impair beneficial uses. Current state standards for agricultural practices specify that BMPs for agricultural practices are voluntary. These criteria were developed per EPA guidance at the time and met with EPA approval. Revisions to current water quality standards are generally done through a public process known as "Negotiated Rule Making Process." This process is conducted once every three years. The Idaho Watershed Project is encouraged to provide input and suggestions to the Negotiated Rule Making Committee regarding its concerns over voluntary BMPs for agricultural practices.

Nonpoint solar energy source reductions listed in the North and Middle Fork Owyhee TMDL will be achieved through the combined authorities the State of Idaho possesses within the Idaho Nonpoint Source Management Program and commitments the community makes in the future North and Middle Fork Owyhee Hydrologic Unit Implementation Plan. Section 319 of the Federal Clean Water Act requires each state to submit to EPA a management plan for controlling pollution from nonpoint sources to waters of the state. The 319 Plan must do the following: identify programs to achieve implementation of the best management practices (BMPs); outline schedules containing annual milestones for utilization of the program implementation methods and for implementation of BMPs; obtain certification by the State Attorney General which states that

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[1]Note that flow alteration is not an identified pollutant under § 304(a)(2)(D) of the CWA. Therefore, the EPA would take no action to either approve or disapprove a TMDL submitted for flow alteration (US-EPA, 1999).

adequate authorities exist to implement the plan; and provide a listing of available funding sources for these programs. The current Idaho Nonpoint Source Management Program has been approved by the EPA as meeting the intent of Section 319 of the Clean Water Act.

The Idaho Nonpoint Source Management Plan and the Idaho Water Quality Standards require that if water quality monitoring indicates water quality standards are not met due to nonpoint source impacts, even with the use of current BMPs, the practices will be evaluated and modified as necessary by the appropriate agencies in accordance with the provisions of the Administrative Procedure Act. If necessary, injunctive or other judicial relief may be initiated against the operator of a nonpoint source activity in accordance with the Director's authorities provided in Section 39-108, Idaho Code (IDAPA 16.01.02.350).

As a designated "Responsible Land Management Agency" the Bureau of Land Management has entered into a Memorandum of Understanding (MOU) between the EPA and various State of Idaho agencies (IDHW, 1993). Within the Forestry Practices Appendix to this MOU, federal agencies have agreed to comply with the water quality protection provisions of the Idaho Forest Practices Act Rules and Regulations. Federal grazing regulations (43 CFR 4180) require that the BLM determine if grazing related management practices (grazing systems, permit/lease terms and conditions and range improvements) are achieving the Idaho Standards for Rangeland Health or are making significant progress toward their achievement and conform with the Guidelines for Livestock Grazing Management. Additional federal agency responsibilities are also defined in 40 CFR Part 130 as needing to comply with State requirements to control water pollution to the same extent as private entities.

Required pollutant load reductions as established by a TMDL, combined with an implementation plan, set the sideboards for a general pollution control strategy and an expected time frame in which water quality standards will be met. Again, the Idaho Watershed Project is encouraged to participate in the formation of the WAG, the development of the North and Middle Fork Owyhee TMDL Implementation Plan, and to continue to collaborate and to cooperate with local landowners and designated land management agencies in the achievement of high water quality in this region.

ADDITIONAL COMMENTS ON THE NORTH, SOUTH AND MIDDLE FORKS OF THE OWYHEE RIVER DRAFT SBA/ TMDLS

In addition to the lengthier comments mailed to you earlier today on these two draft TMDLs, Idaho Watersheds Project would like to incorporate comments IWP made earlier this fall in regard to the draft TMDLs for the Lemhi River and tributaries about the inadequacy of current Idaho administration of Clean Water Act requirements. I have enclosed copies of those comments for your review.

In particular, IWP is concerned that Idaho's Best Management Practices (BMPs) for agricultural non-point source pollution are entirely voluntary in nature. Because the main source of temperature pollution, sedimentation, stream degradation, and bacterial contamination on the North, Middle, and South Forks of the Owyhee River is a direct consequence of public lands ranching, under current law, it would appear impossible to have any TMDL met at any time in the future as long as BMPs remain voluntary. Until this loop hole is changed to require BMPs as part of any implementation plan, no TMDL proposed of these watersheds will have any meaning whatsoever.

Response: Comments noted.

In general, Idaho Watersheds Project is pleased with the level of information and the proposal for TMDLs on the Lemhi River and the identified tributary streams which are listed in the 303(d) list. As far as the proposal goes, it is a good start. However, IWP is interested in proposing some improvements not only in the process of developing the TMDLs but also in the subsequent necessary production of management plans and recovery of water quality to meet the anti-degradation standards to support all beneficial uses.

On page 1 of the Executive Summary it states: "altered flow conditions resulting from diversion of surface waters for irrigation have eliminated migratory components of resident fish species and elevated risk to isolated fish populations. Water rights for irrigation are legally protected property rights of state law which will not be addressed as part of the TMDL, however the wide disconnection of tributaries from the Lemhi River increases the importance of the recovery of beneficial use support and salmonid spawning within the watershed." IWP is concerned that a major cause of the lack of support for all beneficial uses in tributary steams and the main Lemhi River is not being addressed in this TMDL. While DEQ has developed a policy that states "habitat modification and flow alteration, which may adversely affect beneficial uses, are not pollutants under section 303(d) of the Clean Water Act," this conclusion is in disagreement with advisory committee report to the Environmental Protection Agency (EPA) which states that there are seven necessary components of the TMDL implementation and development process which include allocation of pollution loads including assignment of control responsibility among sources of impairments. A clear "source of impairment" for the various failures to meet all beneficial uses in the Lemhi River watershed is the de-watering of tributary streams by over-allocated irrigation diversions and stock water diversions. The DEQ has also dismissed any analysis of the Mill Creek watershed in the development if TMDLs because "presence is given to legal water rights, over any water quality issue resulting from flow alteration thus a TMDL would not be meaningful for flow alteration."

Response: Comments are not directed at the South Fork SBA

This exclusion of deterring and flow alteration as well as unscreened headgates and diversions will only result in future legal action which will undermine Idaho's independent claims that water diversion at any level is permissible without regard to its impact on beneficial uses pursuant to the Clean Water Act. As a consequence, IWP strongly recommends that a more thorough evaluation be made in the final development of TMDLs for deterring tributaries as well as their affect on main stream fecal coliform loading problems in your final document.

Response: Comments are not directed at the South Fork SBA

The proposed percentage reductions in sediment for the tributary streams and for fecal coliform in the main Lemhi River appear to be appropriate; however DEQ must also assess the time frame for achieving the TMDL goal and the potential Best Management Practices or other mandatory management actions on federally managed lands which will result in achieving the TMDL. Habitat considerations relating to the functioning condition of the watershed both in the mainstream and the tributaries, as well as land use practices such as livestock grazing or feeding which result in the introduction of bacteria or other wastes into waters on the state, need to be analyzed in setting a final TMDL.

Response: Comments are not directed at the South Fork SBA

IWP is pleased to see that the Idaho Falls DEQ office is not proposing to permit degradation of currently compliant waters in the Lemhi Basin watershed in order to achieve some improvement on areas already listed on the 303(d) list. Such a proposal has unfortunately been developed for the TMDL proposal for the Middle Fork of the Payette River.

Response: Comments are not directed at the South Fork SBA

IWP is also of the opinion that in the future additional streams within the Lemhi River watershed as well as the mainstream of the river will be added to the 303(d) list for failure to meet other anti-degradation criteria for beneficial uses other than those currently listed. The whole watershed has been deeply degraded and continues to be suffering the consequences of inappropriate land use practices everywhere. Therefore, it would seem extremely important that the DEQ establish specific time-certain objectives for meeting these particular TMDLs addressed in this document. Without the certainty provided by such a timetable, current practices which cause the identified degradation, and other degradation, and other degradation of water quality which remains unidentified solely because of the lack of data, will not be charged.

Response: Comments are not directed at the South Fork SBA

Thank you for the opportunity to comment; IWP looks forward to receiving the final copy of the TMDLs with corrections as suggested.

This letter constitutes the comments of Idaho Watershed Project in regard to the Draft Subbasin Assessment and Total Maximum Daily Load for the North and Middle Fork Owyhee River watersheds.

IWP is concerned that the draft document is deficient in dismissing all but temperature violations of Idaho state water quality standards. Sedimentation, flow modification, and bacterial loading in violation of state water quality standards exists on these tributaries of the Owyhee River and their own tributaries such as Squaw Creek; Noon Creek; Juniper Creek, Pleasant Valley Creek, Cabin Creek and Corral Creek. The biological and chemical data collected by DEQ during 1999 does not appear to be sufficient to result in the dismissal of sediment and bacteria levels as a violation of state water quality standards. IWP has also objected in the past to the current protocol for BURP assessments of aquatic life as sufficient to determine compliance for various aspects of water quality standards such as sediment load, cold water biota, and salmonid spawning. It is an obligation of the DEQ to develop adequate information to determine that a reduction in sediment load or bacteria condition is necessary as part of this TMDL development pursuant to the Clean Water Act. The document indicates a cursory commitment to further analysis of these steams to assess bacterial and sediment loading as well as salmon spawning. Any TMDL finalized as part of this process must include a commitment of an annual assessment of compliance with other areas of water quality which are not addressed under the draft TMDL with a schedule for addressing needed changes in the TMDL. IWP is concerned that the DEQ will delay necessary changes both within any implementation plan and also as an amendment to the TMDL for these streams. IWP also notes that the DEQ has failed to address the issue of aesthetics as a beneficial use of these streams in analyzing the need for TMDLs the protect that beneficial use. IWP also objects to the failure to address habitat degradation and altered flow conditions on all the streams which constitute the North and Middle Fork watersheds. A recent advisory committee report to the Environmental Protection Agency (EPA) states that there are seven necessary components of the TMDL implementation and development process which include allocation of pollution loads including assignment of control responsibility among sources of impairments. A clear "source of impairment" for he various violations of beneficial achievement in the North and Middle Fork watersheds is flow alteration and habitat degradation either through diversions o f various sorts or heavy ongoing annual impacts from livestock use of this area. IWP opposes the DEQ's acceptance of a temperature criteria protecting a single salmonid life stage (spawning) as adequate. All stages of salmonid life must be protected if this beneficial use is to continue to exist and recover in these streams. The DEQ must address the reality that sediment within these stream systems may be impairing beneficial uses of salmon spawning and cold water biota. If there is impairment occurring, the DEQ must address it at this time within the TMDL document. Because of the inadequate assessment for excess sedimentation, the DEQ cannot dismiss sedimentation without a necessary TMDL at this time. The Subbasin Assessment states that percent finds in these stream system are "high" yet the DEQ includes no TMDL to address sedimentation. Appendix C of the document undermines the DEQ's acceptance of a conclusion that their macro vertebrate surveys indicate conformance with state water quality standards for sediment. This BURP process as indicated in Appendix C has provided sufficient information to indicate that on many tributaries no cold water organisms were found. IWP is also opposed to the use of Proper Functioning Condition Analysis of streams to confirm compliance with sediment loading since this is a non-scientific process and streams placed in a Functioning At Risk category do not appear to require any action by the DEQ to facilitate a higher function rating.

IWP is concerned that analysis of bacterial contamination in violation of water quality standards is also inadequate. Even though the September 2, 1999 update for bacterial analysis states that "so far, data indicates we are exceeding state criteria," the DEQ proposes no TMDL for bacterial contamination of these streams.

The failure of DEQ to assess and address TMDLs for aesthetically impaired streams is especially destructive of this process. IWP and its members understand that many of these streams are severely impaired aesthetically because of the extraordinary degradation by livestock impacts including vegetation destruction, stream bank trampling, cattle wastes on land and in water, and destruction of fisheries. In addition, high temperature violations also create opportunities for algal mats to form and produce noisome odors and revolting visual contamination.

IWP request that this Draft TMDL be withdrawn and resubmitted to the public as an additional draft with all areas of exceedence addressed and with more thorough assessments of conditions. Finally, IWP is concerned that the development of an implementation plan for these water be accelerated and made part of a final TMDL. For example, it is crucial that some chance in management be implemented in 2000 in order to start to reverse the ongoing degradation of these watersheds with which we are so familiar.

COMMENTS ON SOUTH FORK OF THE OWYHEE RIVER DRAFT SBA/TMDL

IWP provides these additional comments on the South Fork Owyhee SBA/TMDL.

First, IWP incorporates into the South Fork comments all applicable general comments from the North and Middle Fork Owyhee comments above. It is especially important in this regard that DEQ actually address the problems on the South Fork instead if merely deferring development of TMDLs and proposed development of an implementation plan to changes which may or may not occur upstream in Nevada. IWP is fully aware that some of the major problems on the South Fork on the Owyhee River watershed in Idaho are a direct result of abusive land management practice and nonpoint source pollution in Nevada especially from mismanaged livestock grazing. The DEQ must help establish the South Fork as a 303(d) listed stream in Oregon, Idaho, and Nevada in order to recover this remarkably degraded watershed.

Response: It is not within the scope of this document to assess the landuse practices within the State of Nevada. Since the South Fork Owyhee River is Interstate waters, it will the responsibility of the United States Environmental Protection Agency (EPA) to initiate dialogue with the State of Nevada. If the State of Idaho can offer assistance, this option will be explored.

Since sediment is clearly a huge problem in the whole South Fork watershed, DEQ must address this problem. IWP is especially concerned that even though the DEQ acknowledges the absence of salmon species such as Redband trout in the South Fork, it is no action of any kind to recover this beneficial use. IWP also objects to the lack of any analysis of the condition or contribution to nonpoint source degradation of the South Fork by Spring Creek and the East Little Owyhee River . IWP notes that there is a major diversion of the waters of the South Fork upstream of the 45 Ranch on public lands and that at low water, this diversion can result in the virtual drying up of the South Fork. This kind of flow alteration and habitat degradation creates a severe incapability of the South Fork of the Owyhee River to meet its allocated beneficial uses. The Draft SBA/ TMDL fails to address this diversion in any way.

Response: The limited sediment information collected did not indicate that sediments were impairing the beneficial uses or that State of Idaho water quality standards were exceeded. Since Spring Creek is intermittent, it was not assessed as were other intermittent streams within the State of Idaho.

Response: During no periods during the 1999 monitoring effort, was it ever noted that the diversion structure at the 45 Ranch completely de-watered the South Fork Owyhee River. The State of Idaho, Division of Environmental Quality (DEQ), does not believe that stream alteration is a pollutant of concern that can be assessed through the TMDL process.

The DEQ has completely inadequate information on bacterial contamination of the South Fork and its tributaries, especially that caused by cattle wastes. This needs to be rectified before any final TMDL is issued.

Response: As stated in the document (Sec. 2.3.8.) Bacteria samples were collected during the 1999 monitoring effort. Of the five samples collected, none exceeded State water quality standards for either primary or secondary contact recreation. During the 1999 monitoring, all tributaries were intermittent, which does not allow for adequate evaluation of bacteria contamination.

Patricia Klahr, Director of Science and Stewardship
The Nature Conservancy

Having reviewed the Assessment, provided here are the following comments:

1. With 84% of the South Fork Owyhee River watershed in Nevada, the Assessment should attempt to do a more thorough analysis of the status and condition of the river in Nevada. For instance, how many water withdrawals occur in Nevada from the South Fork Owyhee, and what is the total amount of water withdrawn from the South Fork Owyhee drainage in Nevada?

   Response: It was not within the scope of this document to determine landuse practices in

Nevada, but to determine the support status of beneficial uses in Idaho. Further evaluation of land use practices within the entire watershed will be addessed by the State of Nevada.

2. The temperature standard is exceeded as the South Fork Owyhee River enters Idaho. Again, an analysis of what factors within Nevada may be contributing to this situation should be attempted in this assessment.

   Response: It was not within the scope of this document to determine landuse practices in Nevada, but to determine the support status of beneficial uses in Idaho. Further evaluation of land use practices within the entire watershed will be addressed in an assessment by the State of Nevada. Temperature load capacity and allocations have been incorporated into the document. Load allocations have been assigned to waters as it enters the State of Idaho.

3. The Assessment lists the causes of exceedence of temperature standards as solar radiation, ambient air temperature, snowmelt contribution, and other conditions including those influenced by man, such as river morphology and shading. The Assessment makes no mention of the effect of diverting large portions of the flow from the South Fork Owyhee River in Nevada for irrigating of hayfields. These diversions occur in wide, shallow ditches where solar heating is accelerated, prior to this water returning to the river. It seems an accounting for this potential impact should be addressed.

   Response: It was not within the scope of this document to determine landuse practices in Nevada, but to determine the support status of beneficial uses in Idaho. Further evaluation of land use practices within the entire watershed will be assessed by the State of Nevada. Temperature load capacity and allocations have been incorporated into the document. Load allocations have been assigned to water as it enters the State of Idaho.

4. The Assessment should contain a detailed description of the physical and morphological characteristics of the sample sites (the El Paso site and the 45 Ranch) such as river depth, width, substrate type, surround land uses, etc. at each site. How are potential local impacts at the sites, such as between the 45 Ranch (which is an operating cattle ranch), and the remote El Paso Site accounted for?

   Response: Some descriptions of the differing land use practices, are noted in Section 2.7.2 and the impacts to river bank erosion is noted. Further evaluation of land use management and application of BMP will be addressed in the Implementation Plan.

Some discussions on current morphology conditions are stated in 2.7.1. and 2.7.2. It is recognized that more information on river morphology is needed, but the limited time to develop the SBA-TMDL did not allow for more data collection.

P.15 Finally, although we all have felt some "rapture" when in the canyon country of the South Fork Owyhee, I believe the Assessment meant to note the raptors that frequent the canyon.

Response: Comment noted, appropriate changes will be made.

Craig Gerhke
The Wilderness Society

Please accept these comments on the draft South Fork Owyhee SBA/TMDL and the draft North Fork and Middle Fork Owyhee SBA/TMDL from the Wilderness Society.

The Wilderness Society supports the comments submitted by the Idaho Conservation League regarding these matters. The Wilderness Society believes that IDEQ must take stronger measures to protect the beneficial uses of these specific water bodies.

Please keep this office informed of further developments regarding these issues.

Response: See responses addressed to the Idaho Conservation League comments.